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TEMPERATURE MICROSTRUCTURE PROFILES FROM THE SUB-TROPICAL FRONT--ETC(U)

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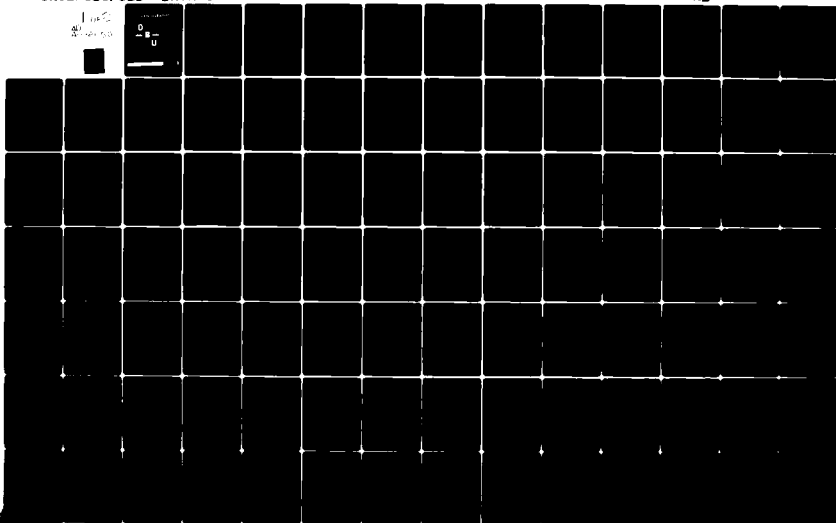
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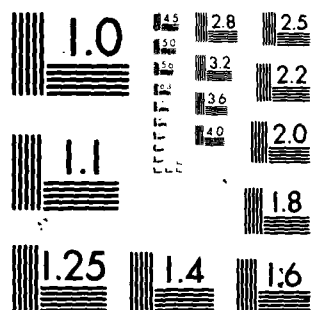
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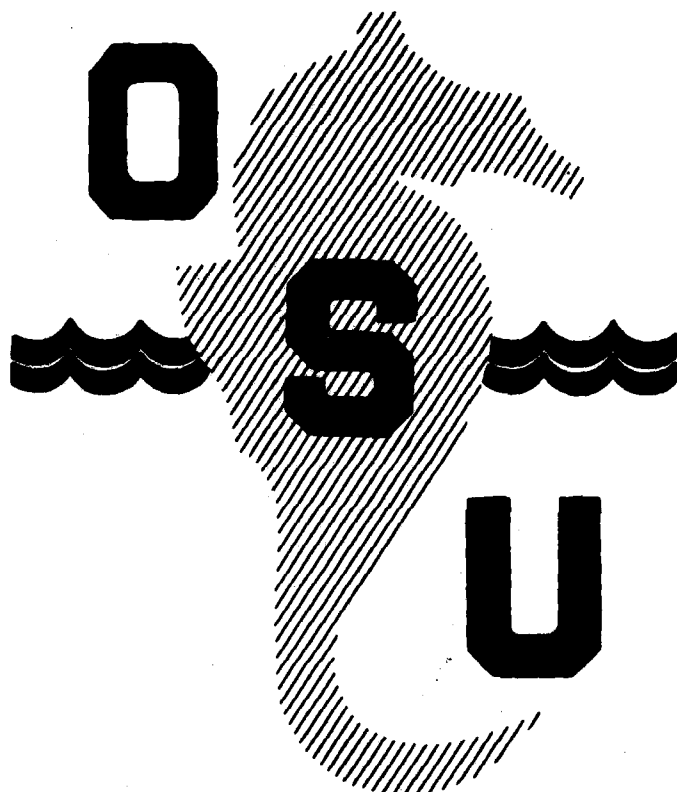
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Temperature Microstructure Profiles  
From the Sub-Tropical Front

by  
T. M. Dillon  
and  
D. R. Caldwell

Data Report 84      Reference 80-10  
September 1980

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TEMPERATURE MICROSTRUCTURE PROFILES  
FROM THE SUB-TROPICAL FRONT

by

T.M. Dillon and D.R. Caldwell

School of Oceanography  
Oregon State University  
Corvallis, Oregon 97331

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## Table of Contents

	<u>Page</u>
Acknowledgments	
Introduction	1
References	2
Table of Station Locations	3
Map of Frontal Area	4
Weather Observations	5
Temperature Profiles	6
Optical Transmissivity	119
Kinetic Energy Dissipation Estimates	121

## INTRODUCTION

This report is a preliminary presentation of temperature microstructure data resulting from the FRONTS experiment in January 1980. During the experiment, four stations were occupied in the sub-tropical front area northeast of Hawaii; in addition, a transect of five stations was run across an active frontal area, and stations far north and far south of the frontal zone were occupied for comparison with the fronts area.

The Microstructure Profiler (MSP) has been described in the literature (Caldwell, Wilcox, and Matsler, 1975; Dillon and Caldwell, 1980a; Caldwell and Dillon, 1980; Dillon and Caldwell, 1980b). Pre- and Post-cruise calibrations of the thermistors agreed within  $0.02^{\circ}\text{C}$ . Two independent thermistors were used on each instrument, and the temperature measured by each agreed to within  $0.02^{\circ}\text{C}$ .

Temperatures were recorded with both a low gain and a high gain in the amplifiers. The low-gain thermistors had a resolution of 4 millidegrees, while the high-gain resolution was variable, and usually set at 0.16 millidegrees. The bulk of this report consists of plots of temperature depth-derivative, low-gain temperature, and high-gain temperature. Often, the high-gain temperature plots reveal much more structure, including small-scale inversions and instabilities, than is apparent in the low-gain temperatures.

Kinetic energy dissipation rates were estimated using the Batchelor scale or cut-off wavenumber technique (Dillon and Caldwell, 1980a; Caldwell and Dillon, 1980; Caldwell, Chriss, Newberger and Dillon, 1981). Selected profiles of the dissipation rate have been plotted in the last section of this report.

The low-gain temperature plots contain the vertical temperature derivative to the left in units of  $^{\circ}\text{C}/\text{M}$ . The temperature scale is at bottom and the depth in M is on the left. High-gain temperature profiles are limited to water above the seasonal thermocline (usually  $\sim 120\text{m}$ ) because of dynamic range limitations. The points plotted are not averages, but instantaneous realizations which have been decimated so that the density of plotted points is of order 200 points per inch regardless of the vertical scale.

At the southernmost location, Station F8, the optical transmissivity over a 30cm horizontal path length was measured. Examples of the transmissivity profiles here have been plotted on an arbitrary scale, with "dirty" water to the left, and "clean" water to the right. Much less vertical variation was noted for this Station than has been observed at Ocean Station P or off the Oregon coast.



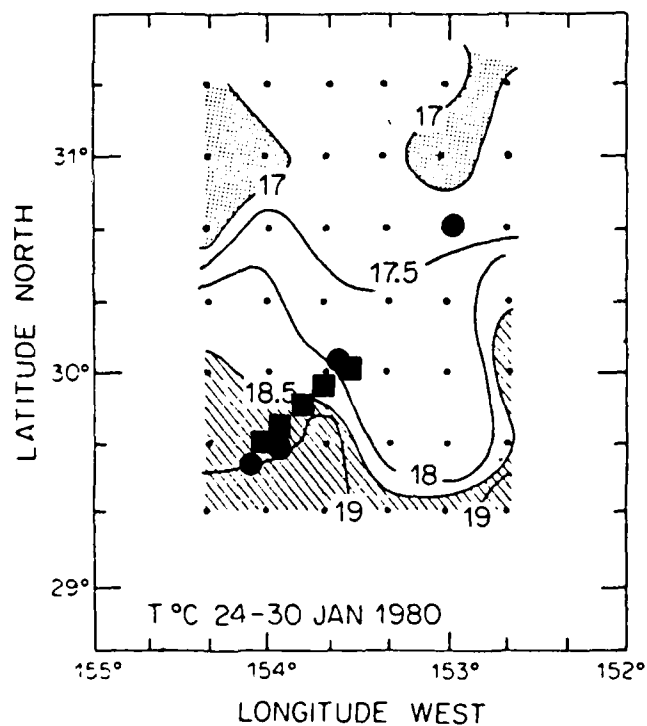
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- Caldwell, D.R., S.D. Wilcox, and M. Matsler (1975). A relatively simple freely-falling probe for small-scale temperature gradients. Limnology and Oceanography, 20, pp 1035-1047.
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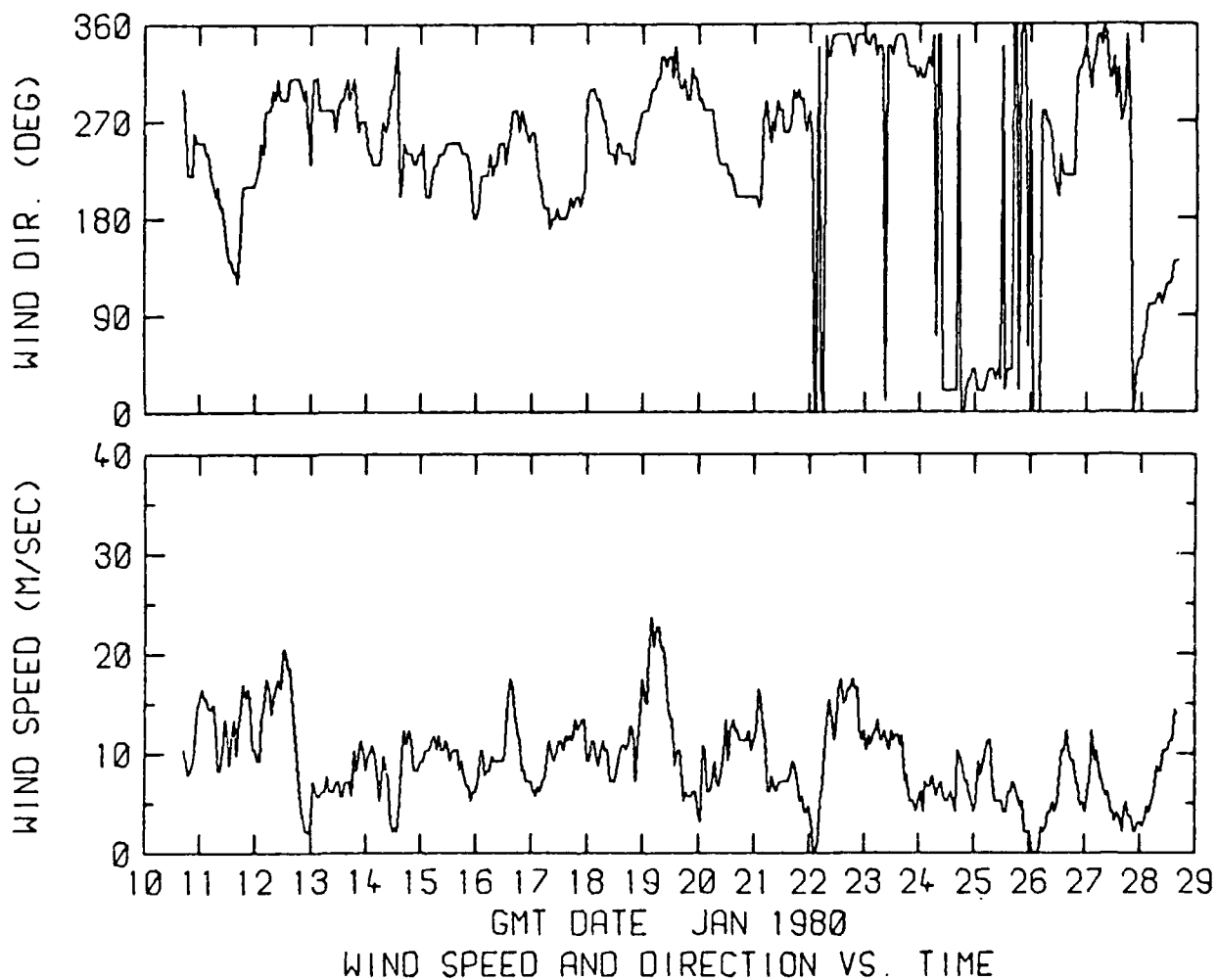
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Latitude and Longitude of Microstructure Stations  
Occupied by the NOAA Ship OCEANGRAPHER

<u>Station No.</u>	<u>Latitude-Longitude</u>	<u>Date (Jan 80)/Time (GMT)</u>
F1	33°56'N-150°2'W	15/01:56-15/13:37
F2	31°00'N-153°00'W	23/18:13-24/04:12
F3	30°20.4'N-153°37.3'W	24/18:25-24/23:52
F5 (transect)	30°20.9'N-153°36.2'W	25/18:35-25/19:30
	30°16.1'N-153°42.6'W	25/20:40-25/21:01
	30°10.1'N-152°49.8'W	25/23:00-26/00:02
	30°01.6'N-153°57.2'W	26/00:54-26/02:58
	29°59.5'N-154°00.6'W	26/03:51-26/05:18
F6	29°58.5'N-154°00.3'W	26/18:35-27/00:21
F7	29°52.5'N-154°06.9'W	27/02:12-27/08:13
F8	26°05.8'N-155°45.1 W	28/19:58-29/02:45



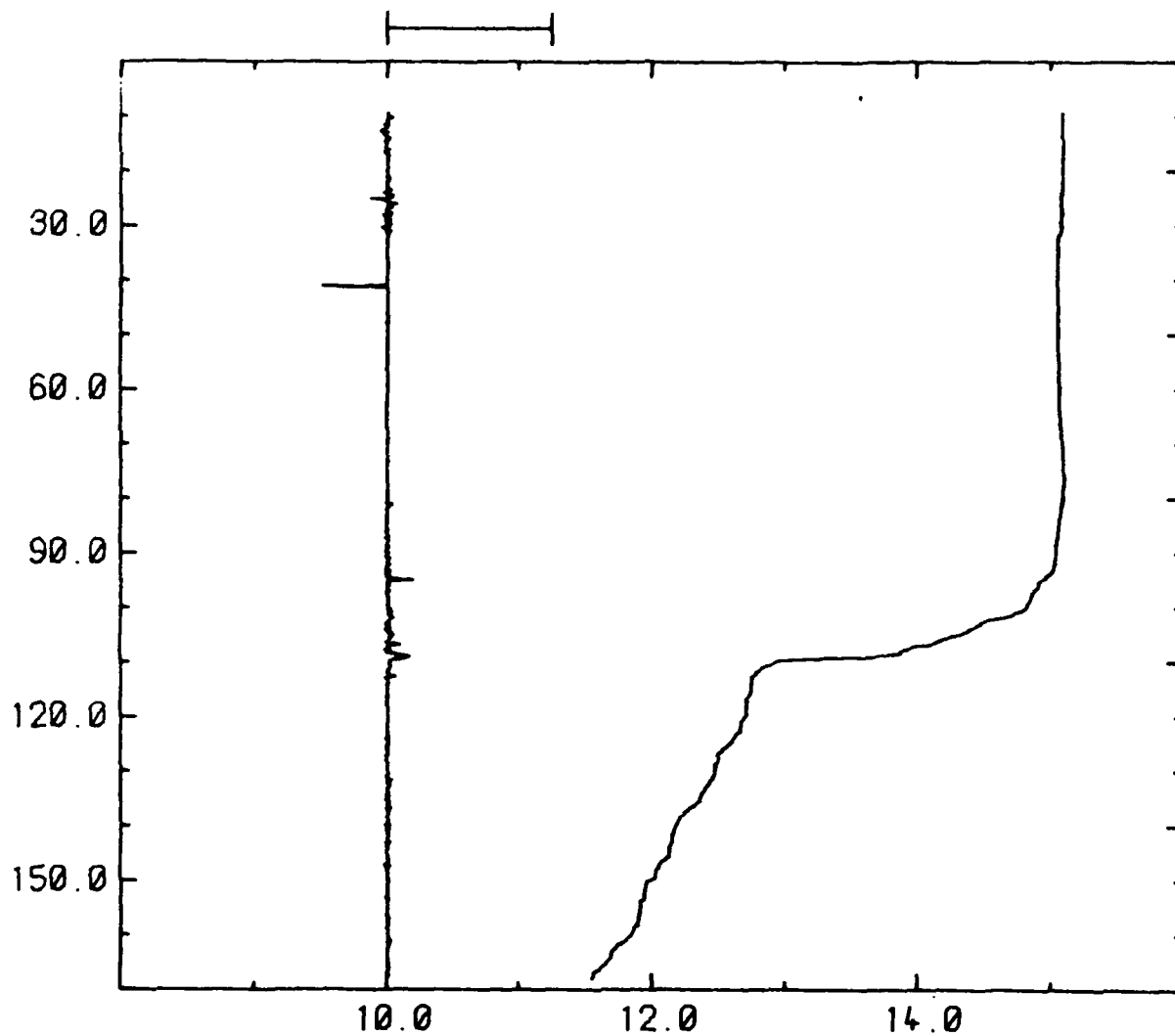
Map of the most intensively studied region, along a line extending to the southwest from 31°N-153°W, overlayed on a preliminary map of sea-surface temperature kindly supplied by Gunnar Roden. Large dark circles are stations occupied for many casts, and large dark squares are transect stations occupied only briefly.



Wind speed and direction as measured aboard the R/V OCEANOGRAPHER during the FRONTS experiment; correction for ship motion has been included. (Plot courtesy of C. Paulson.)

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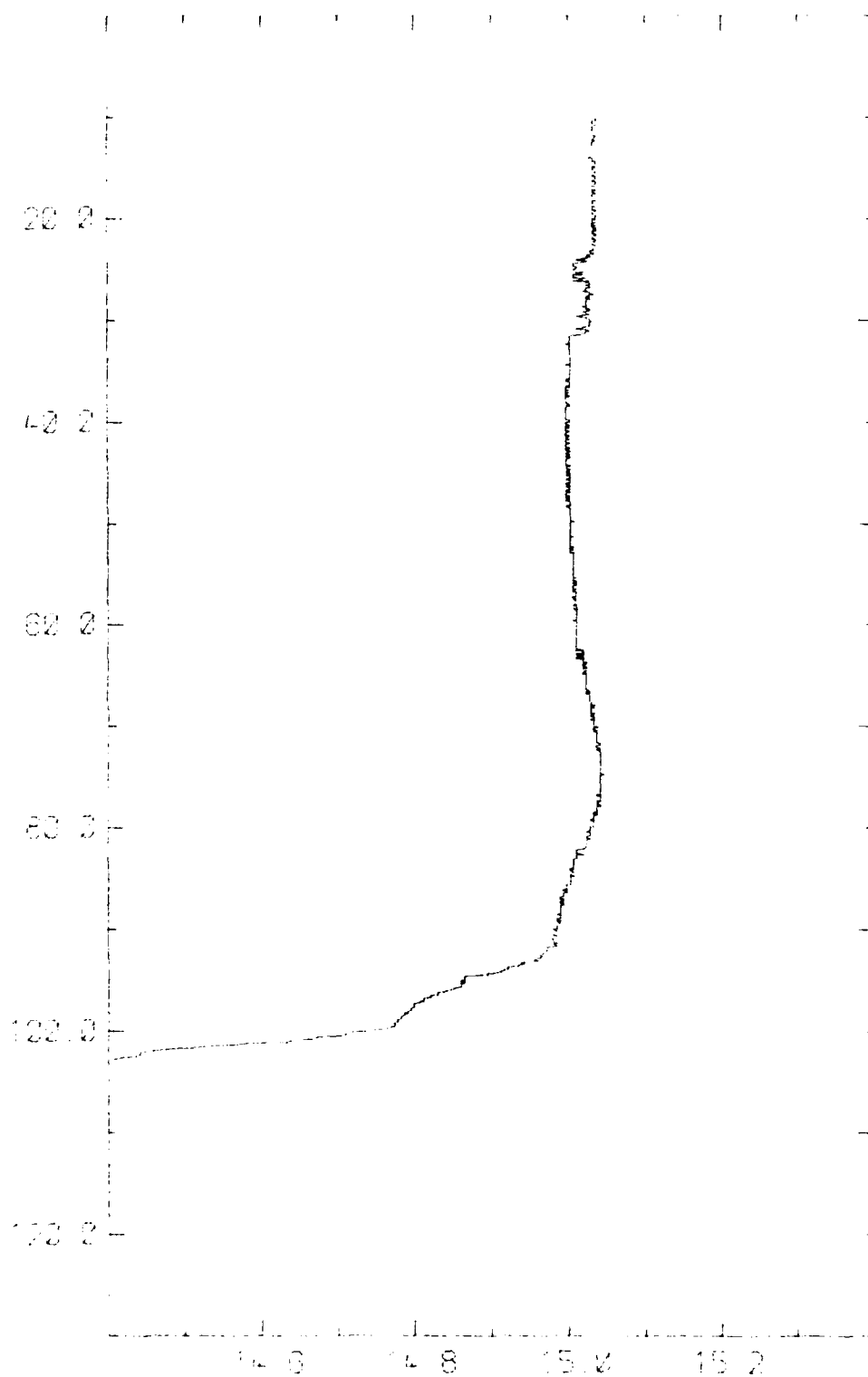
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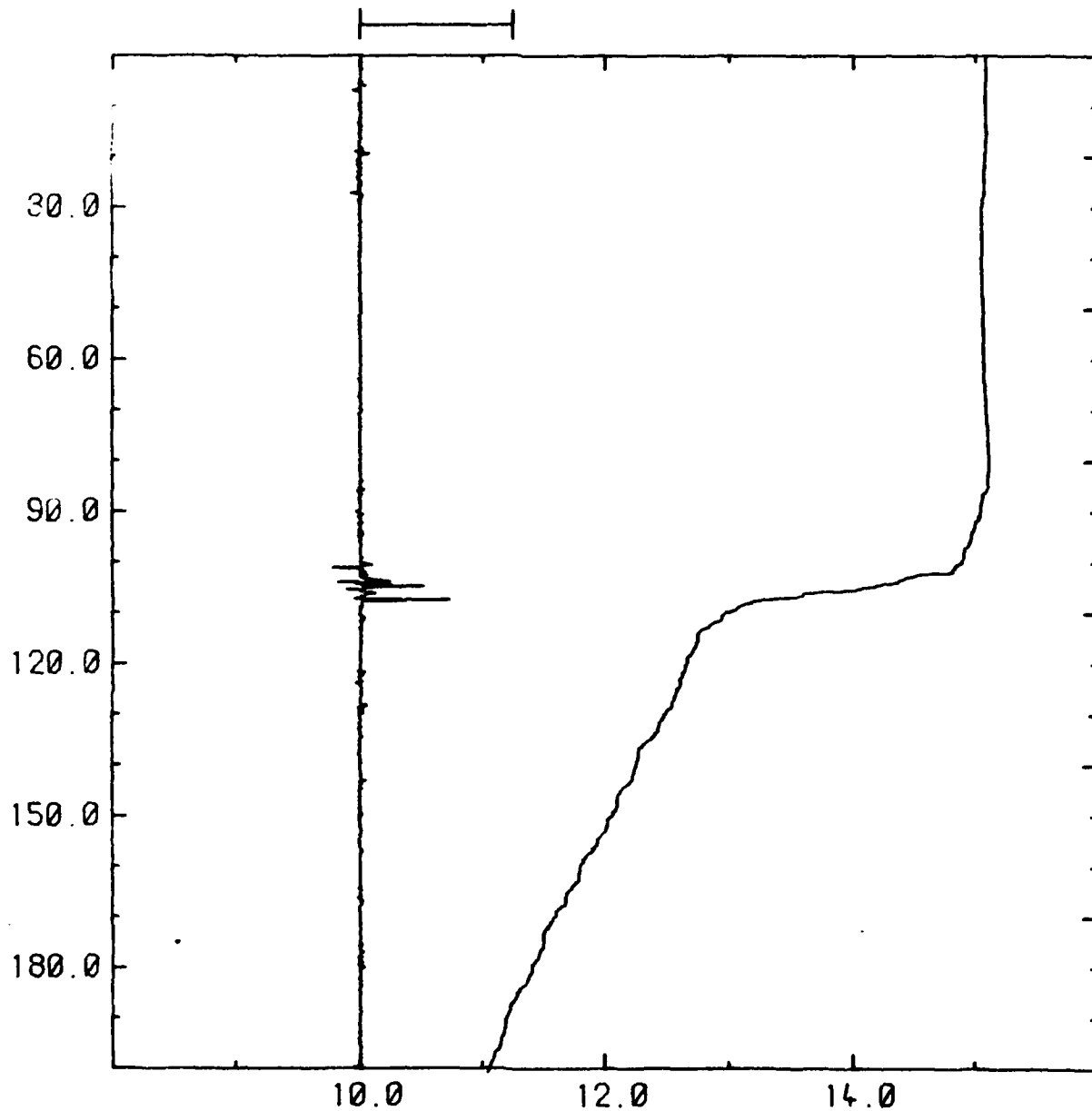
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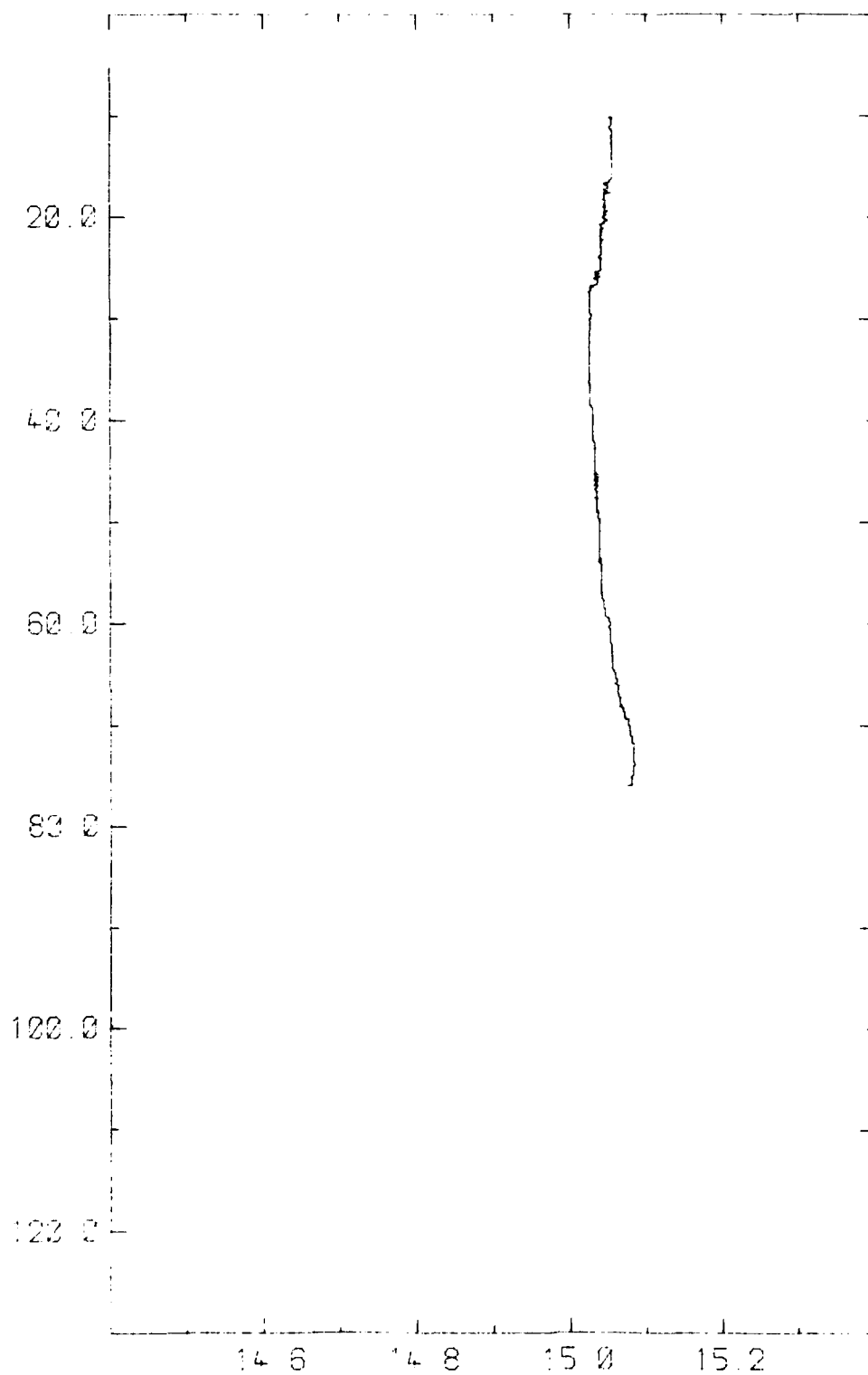
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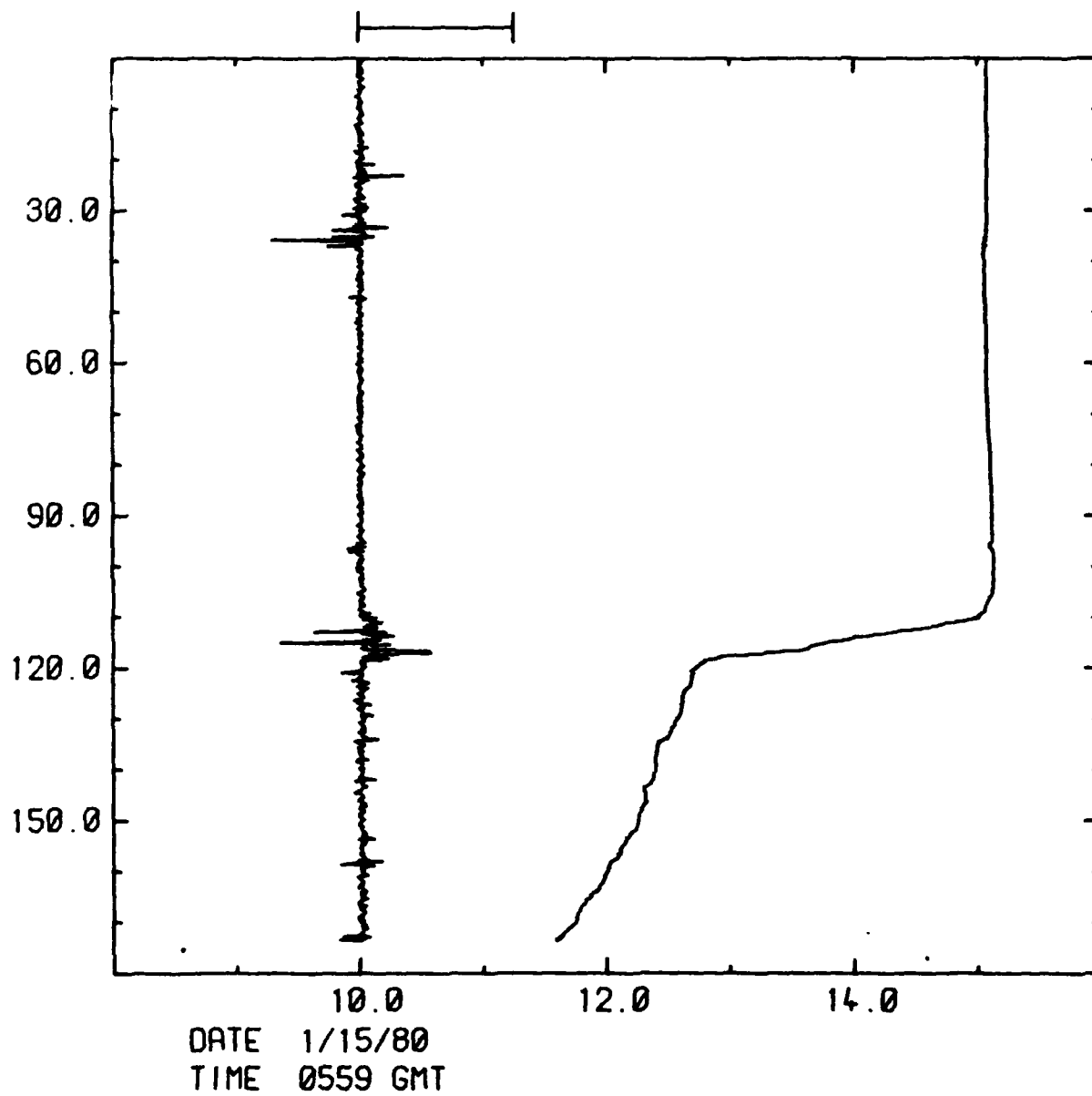
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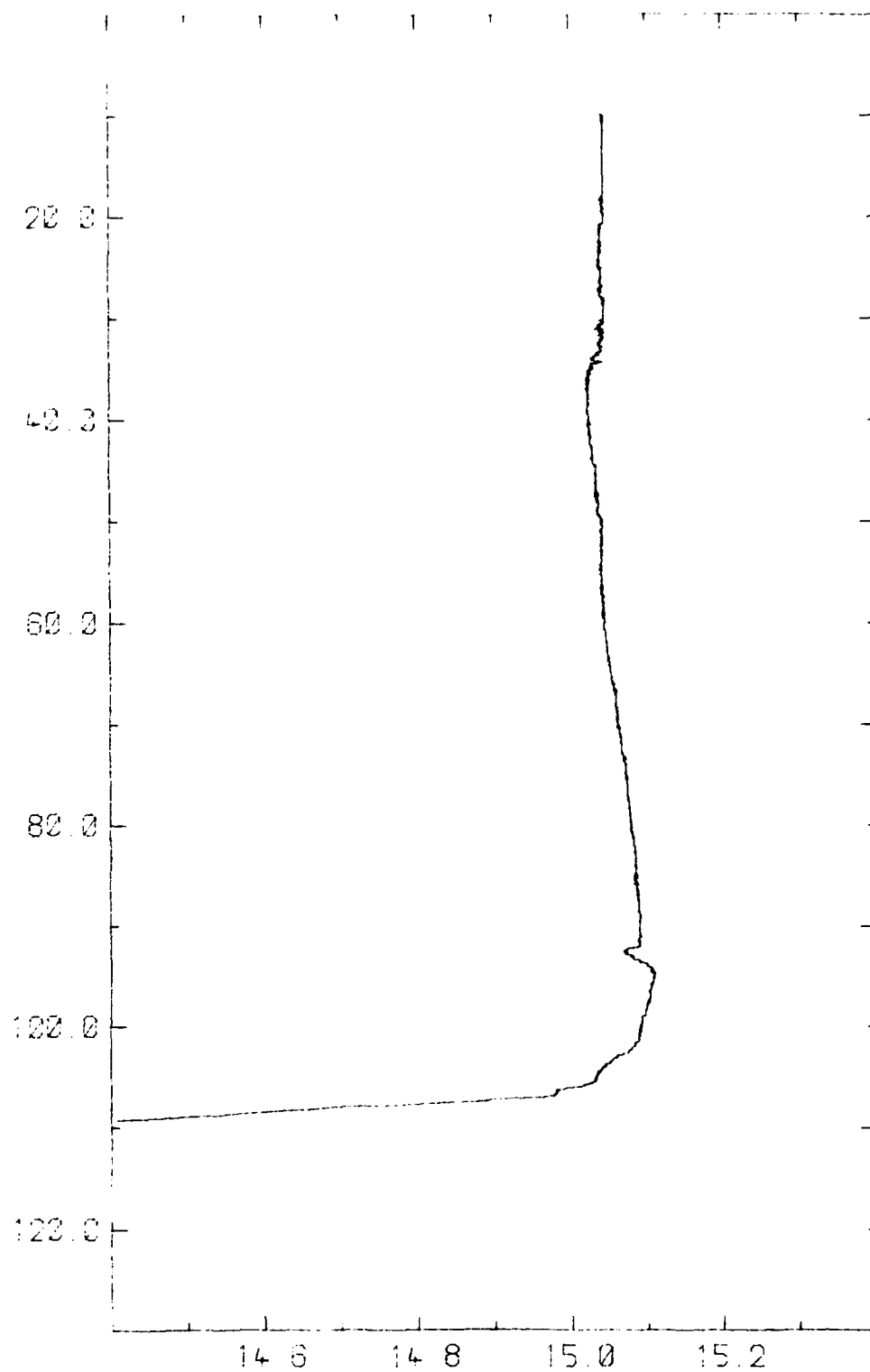


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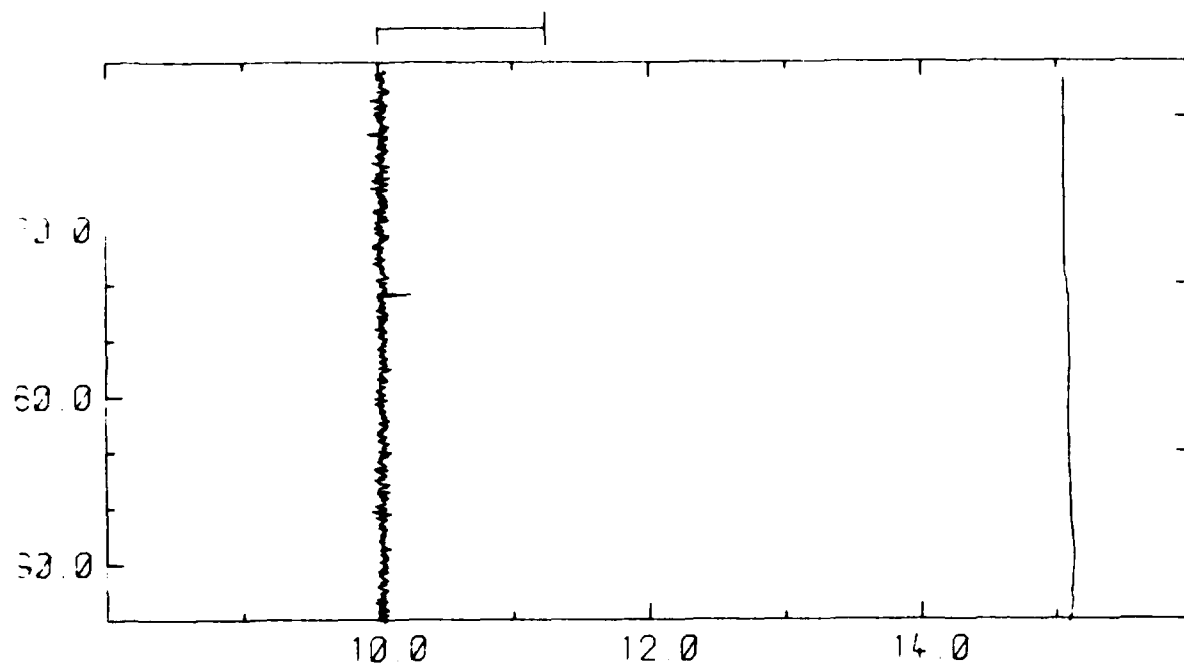
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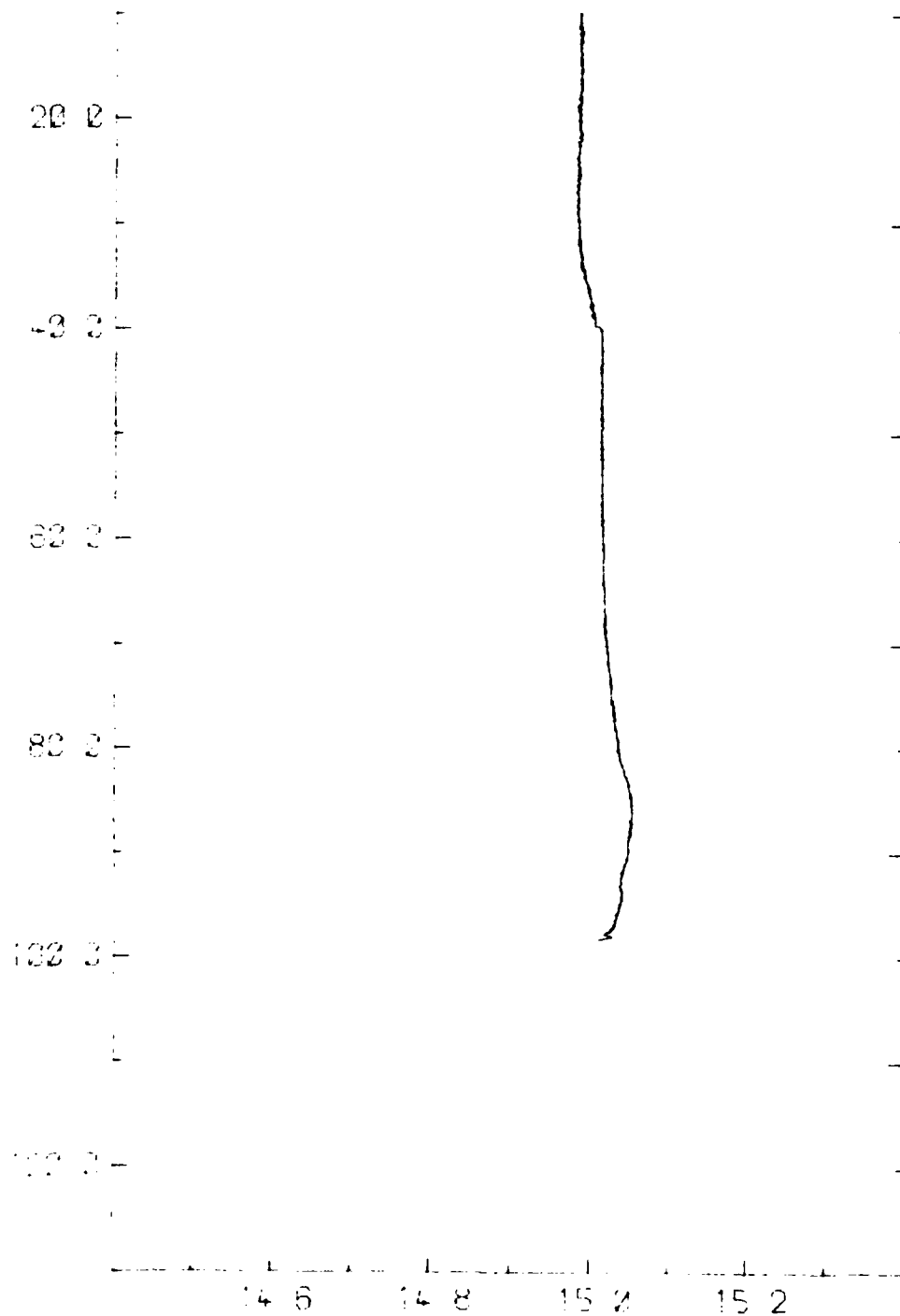
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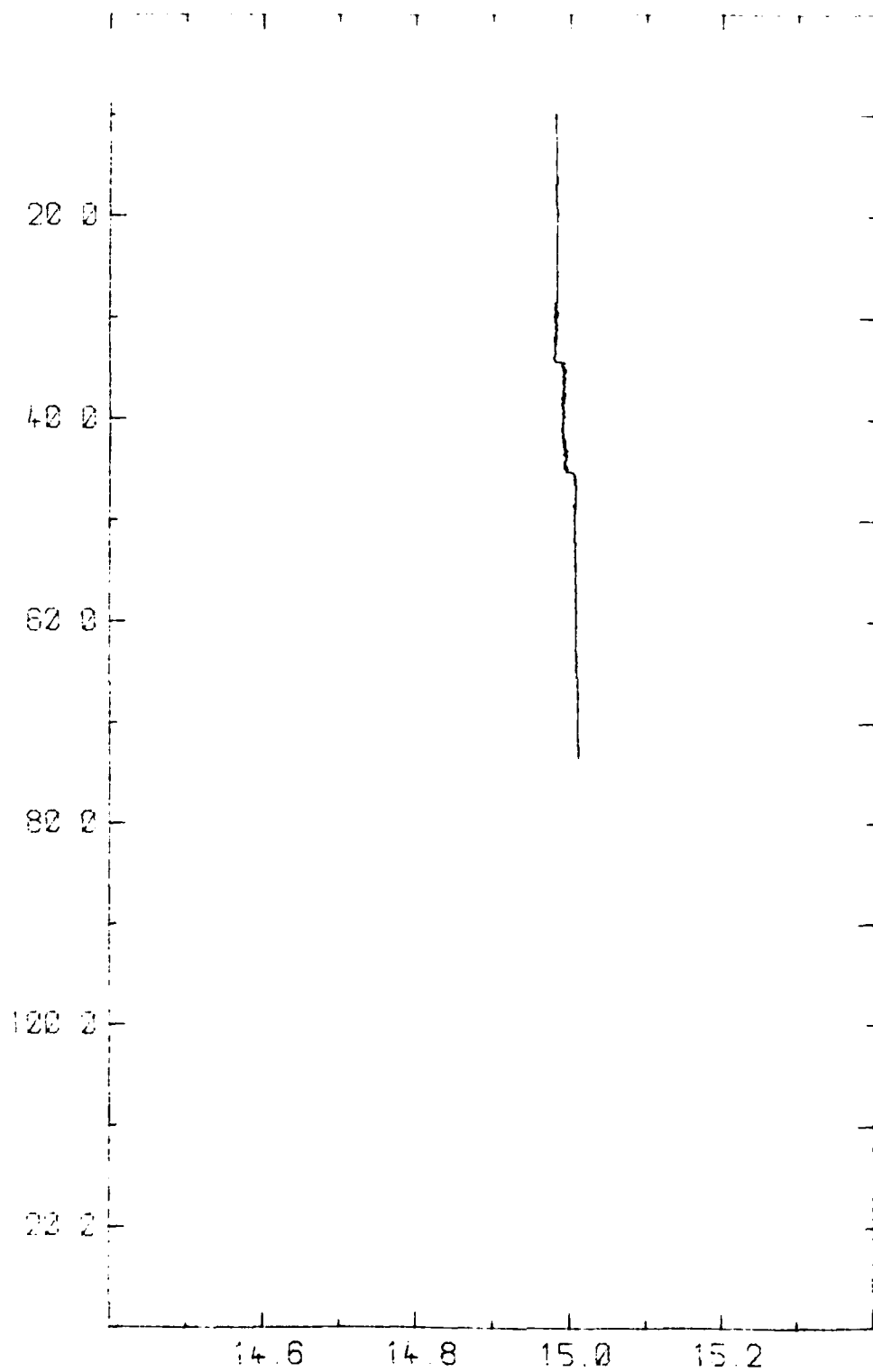
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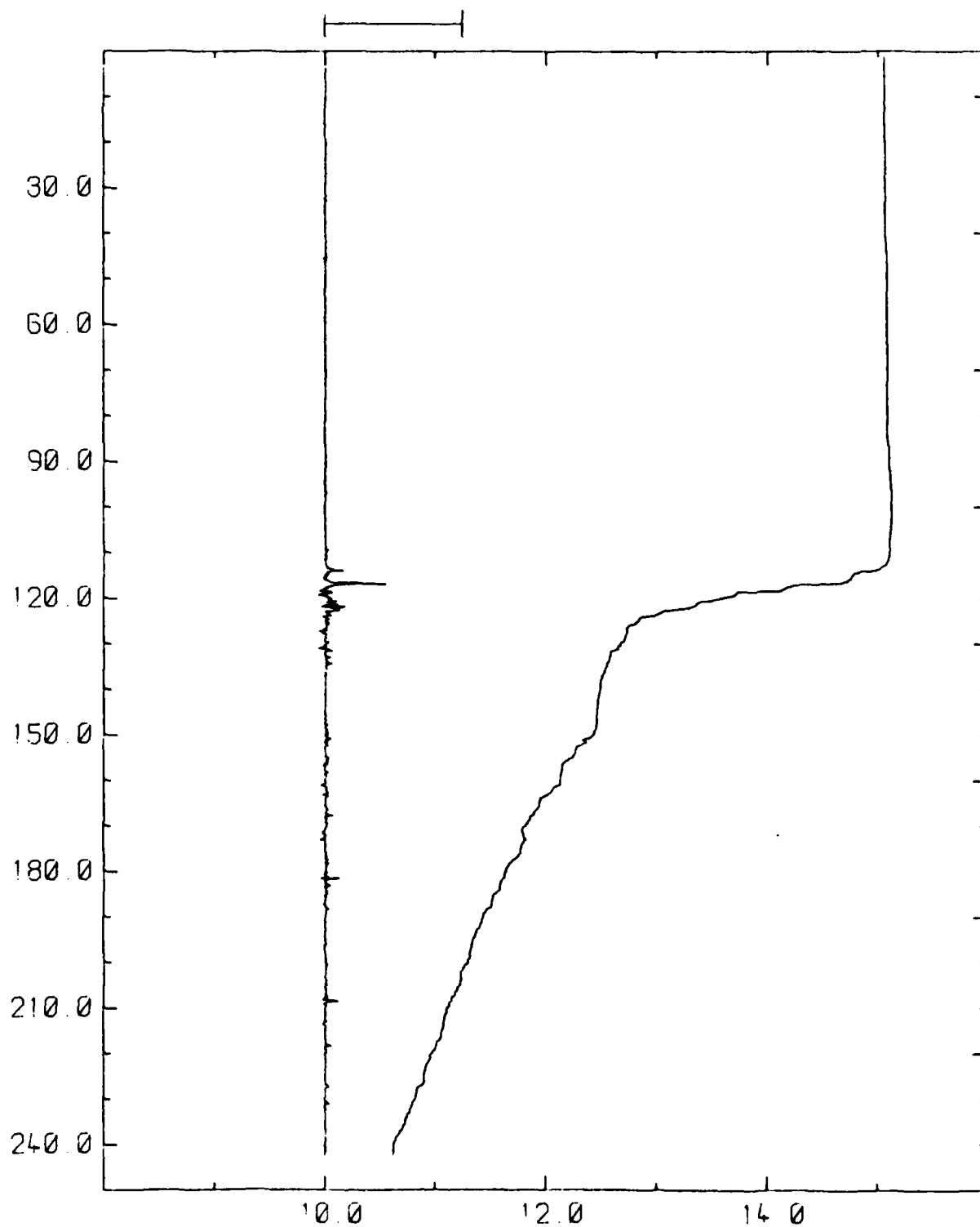
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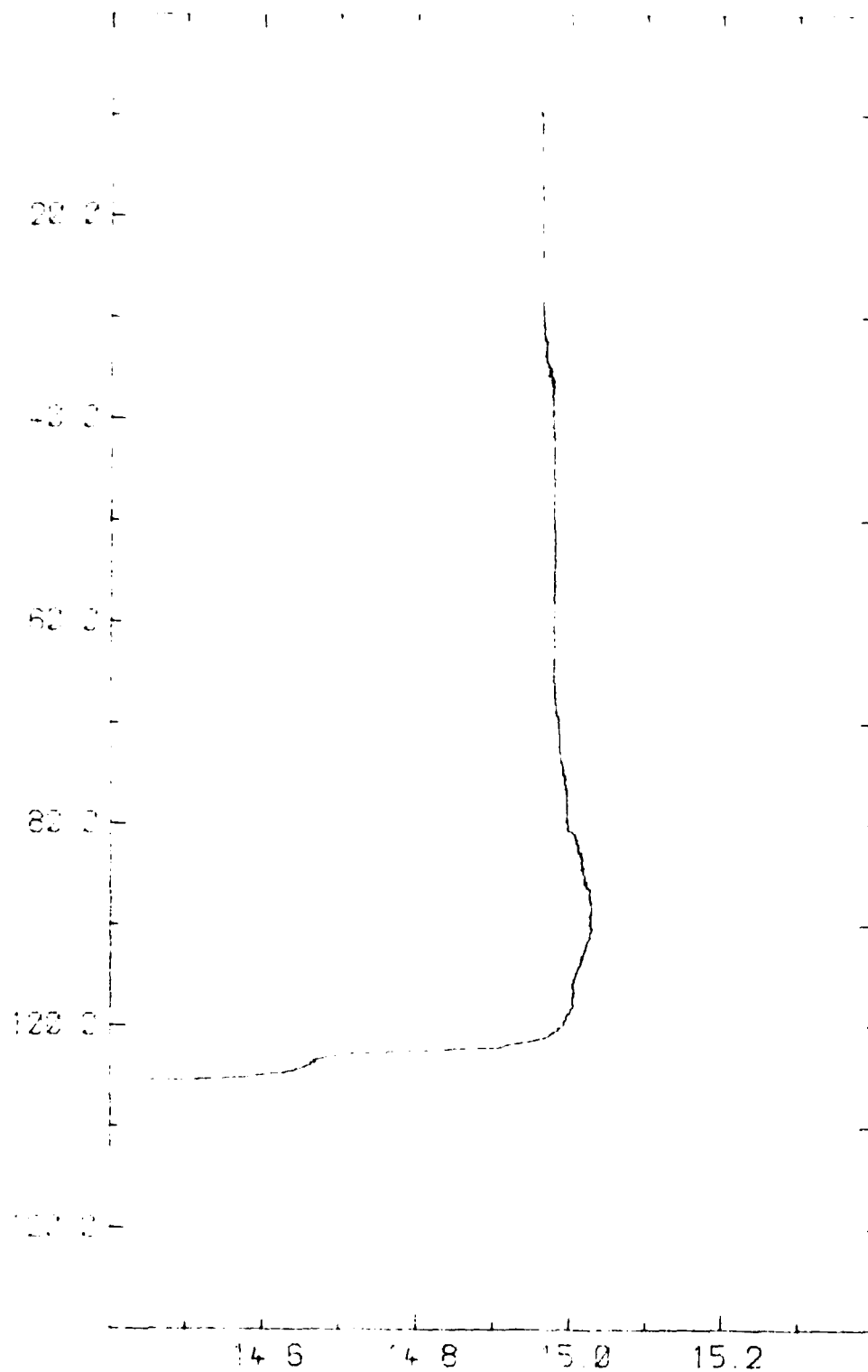
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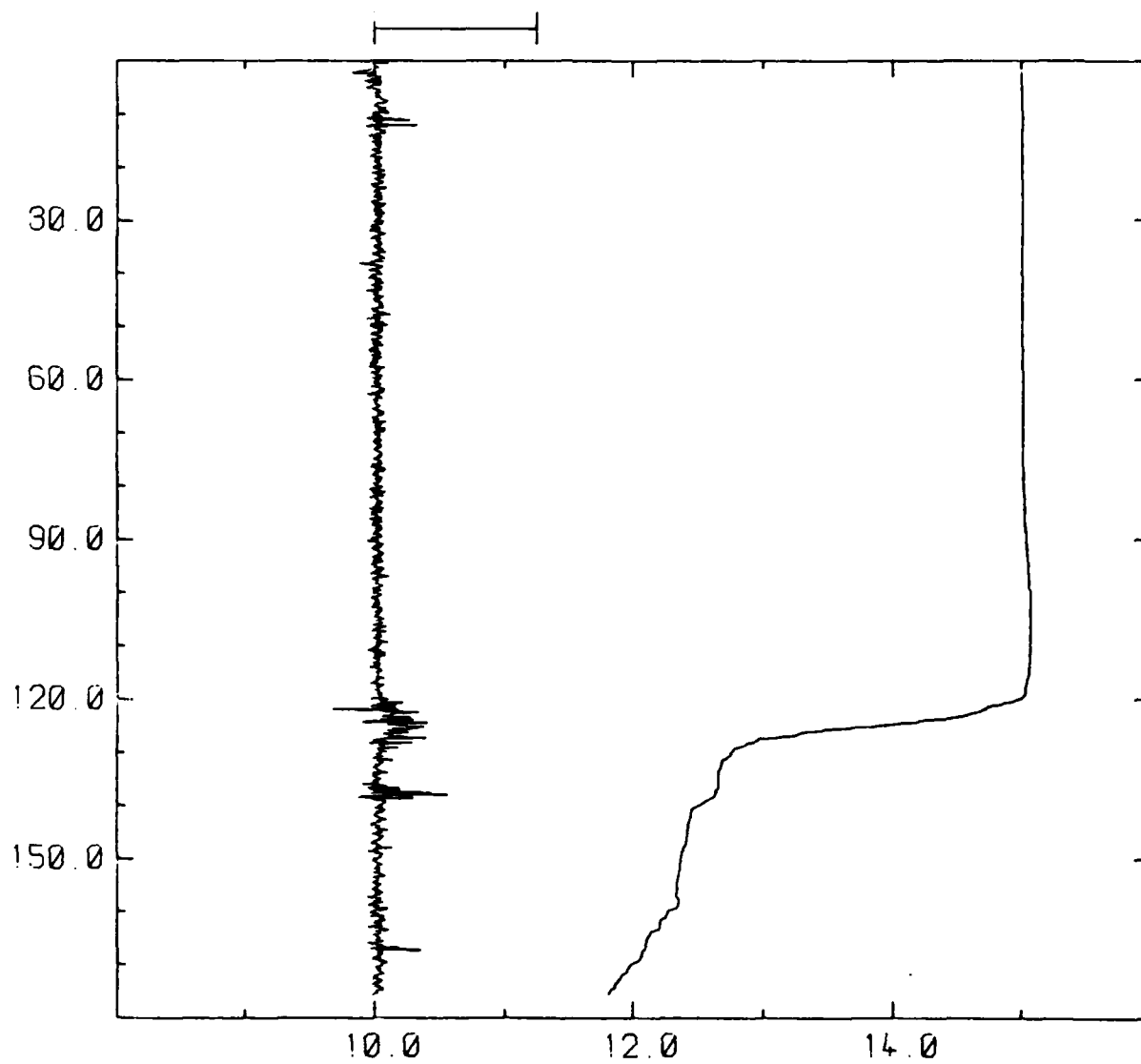
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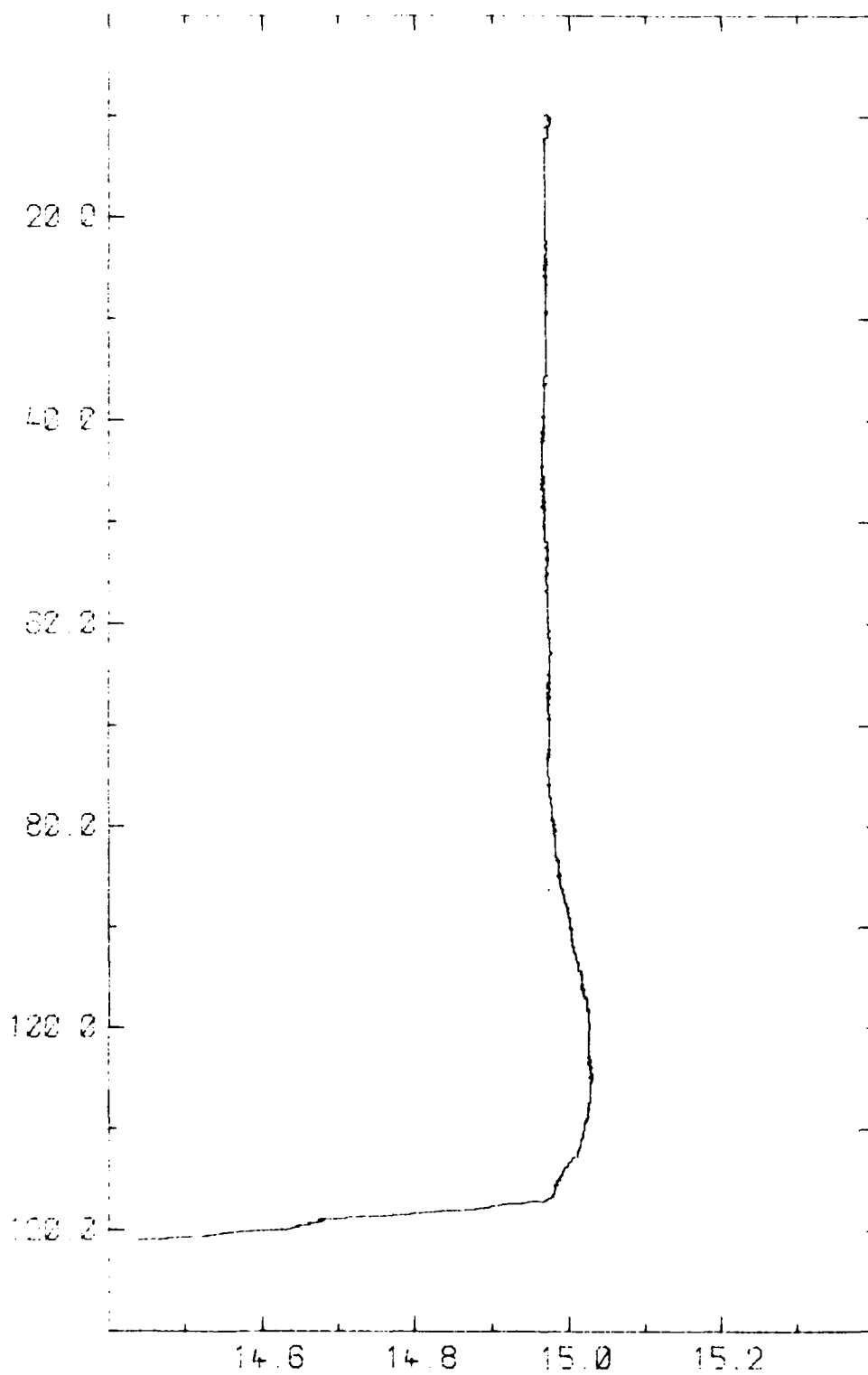


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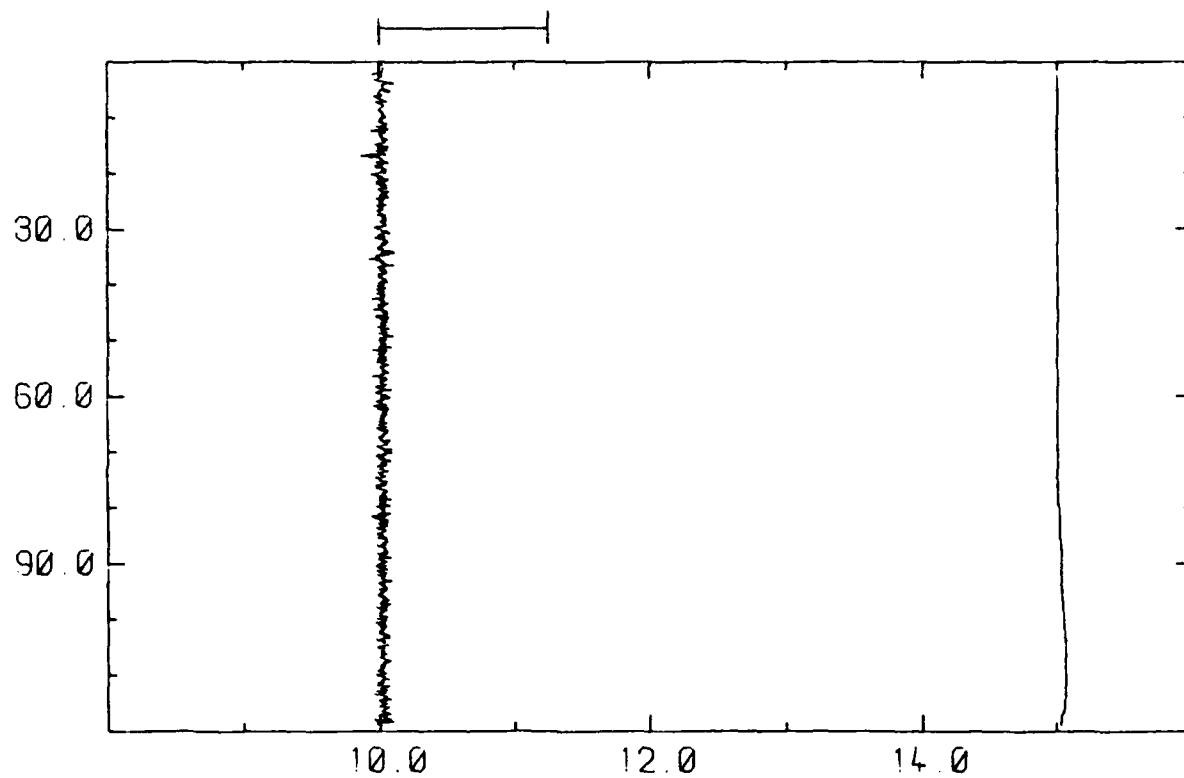
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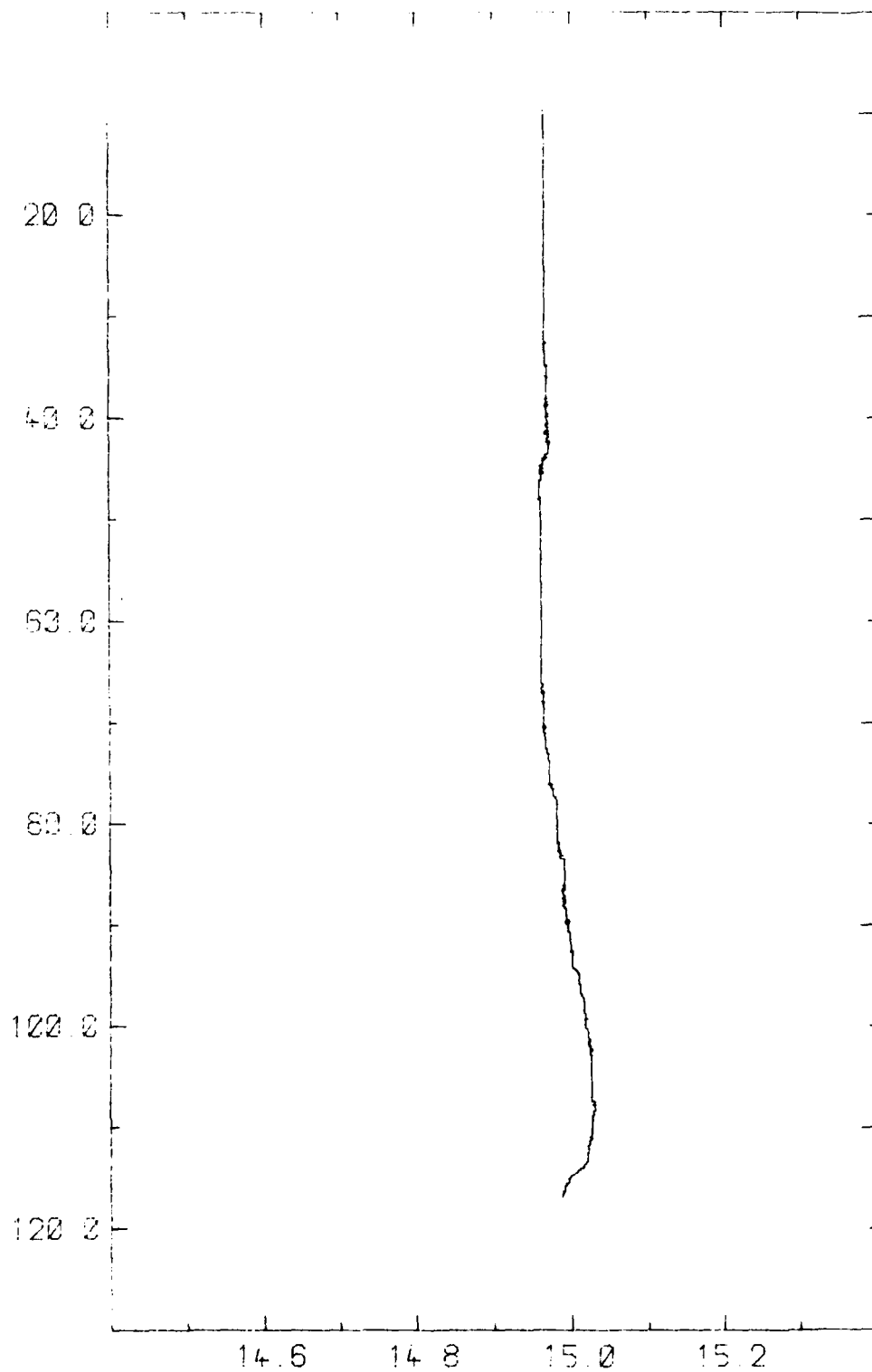
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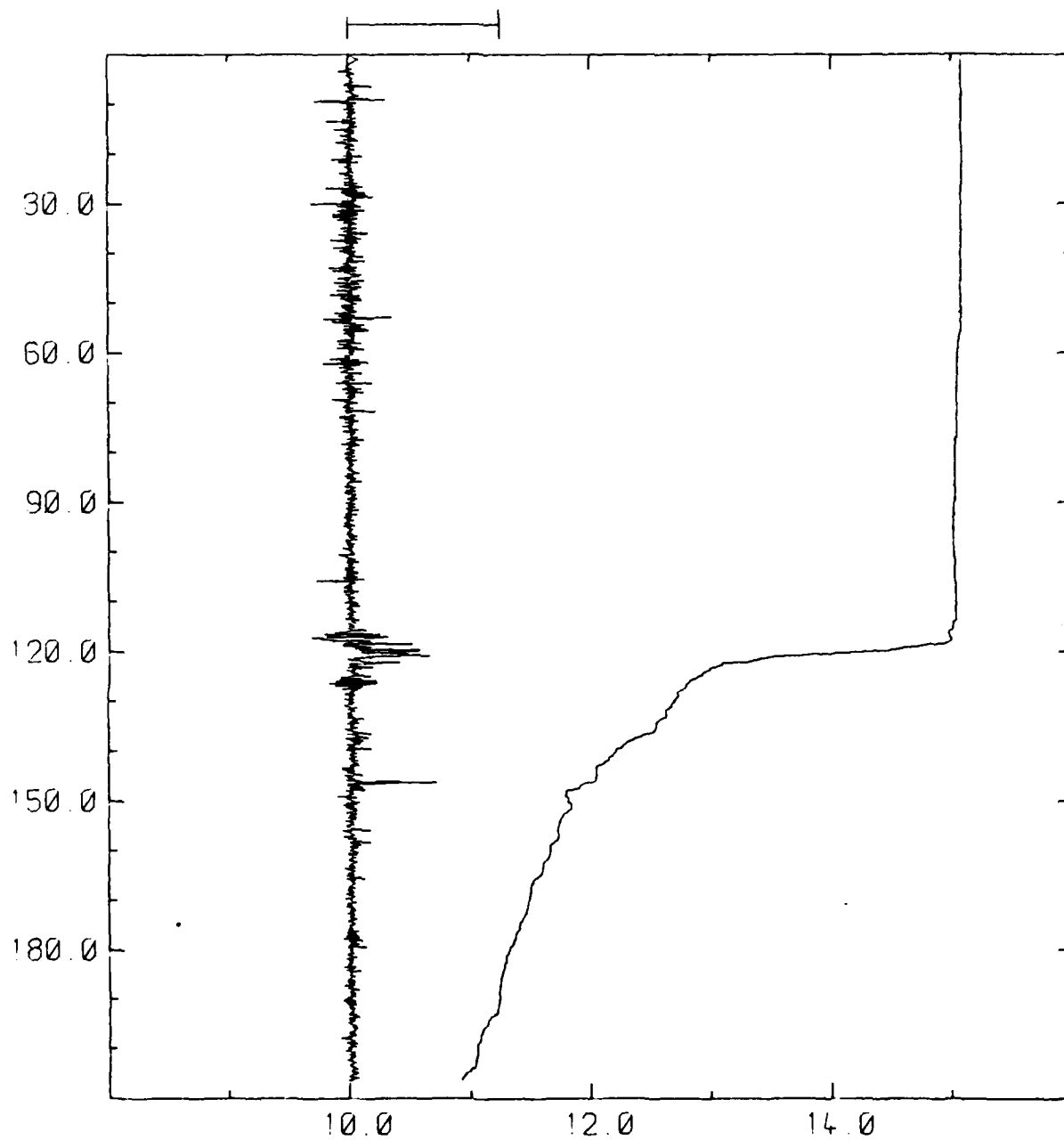
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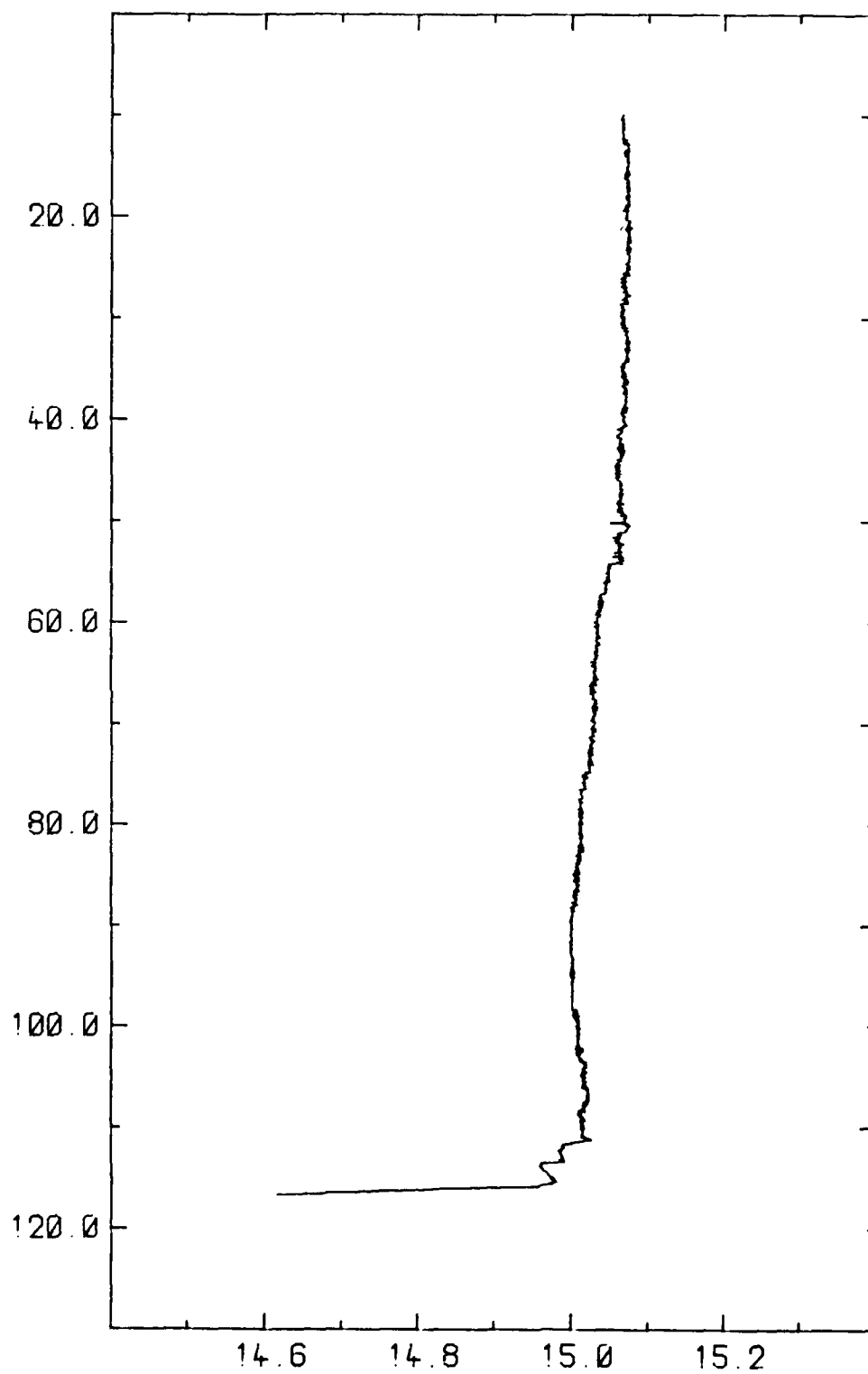
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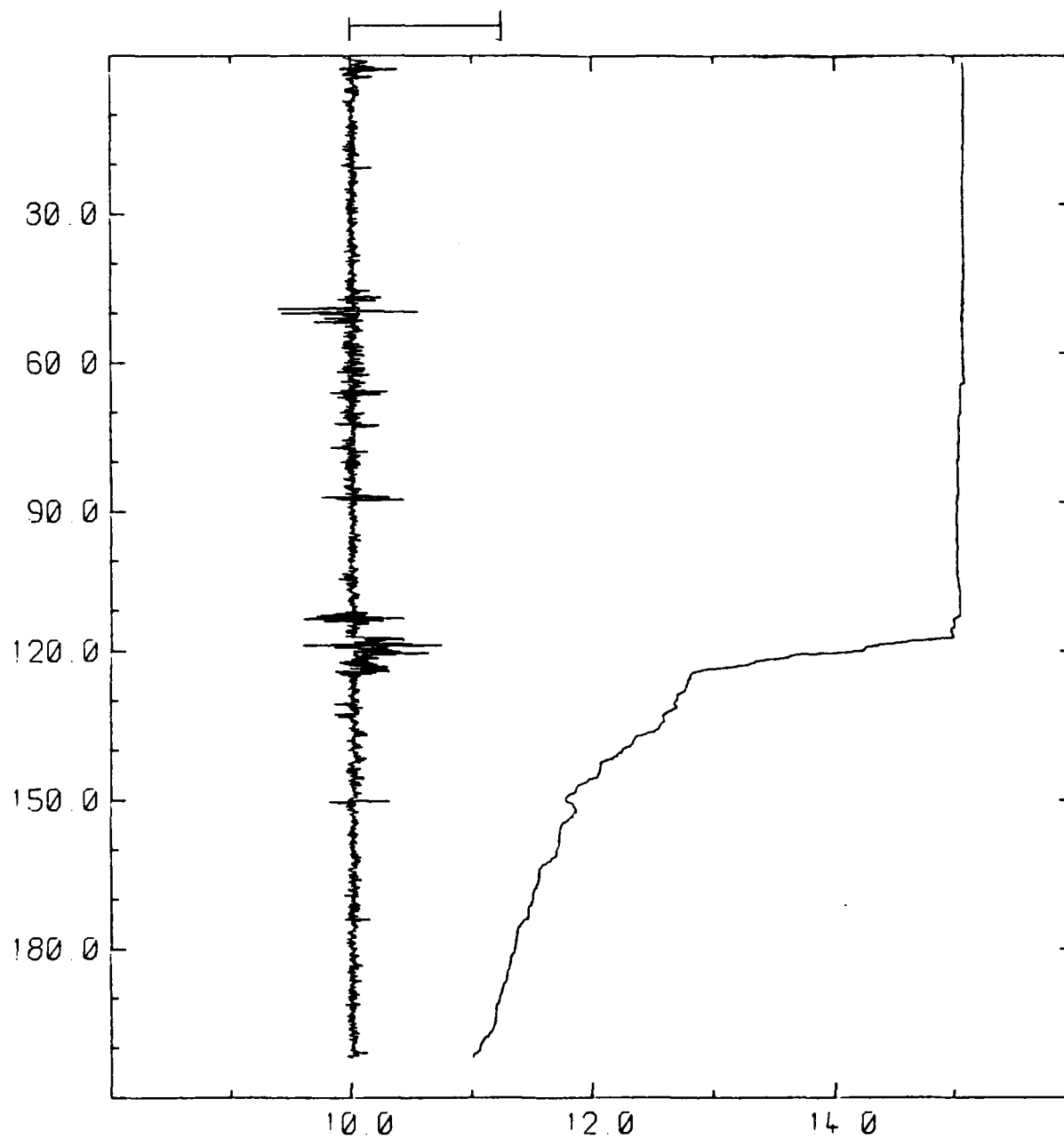
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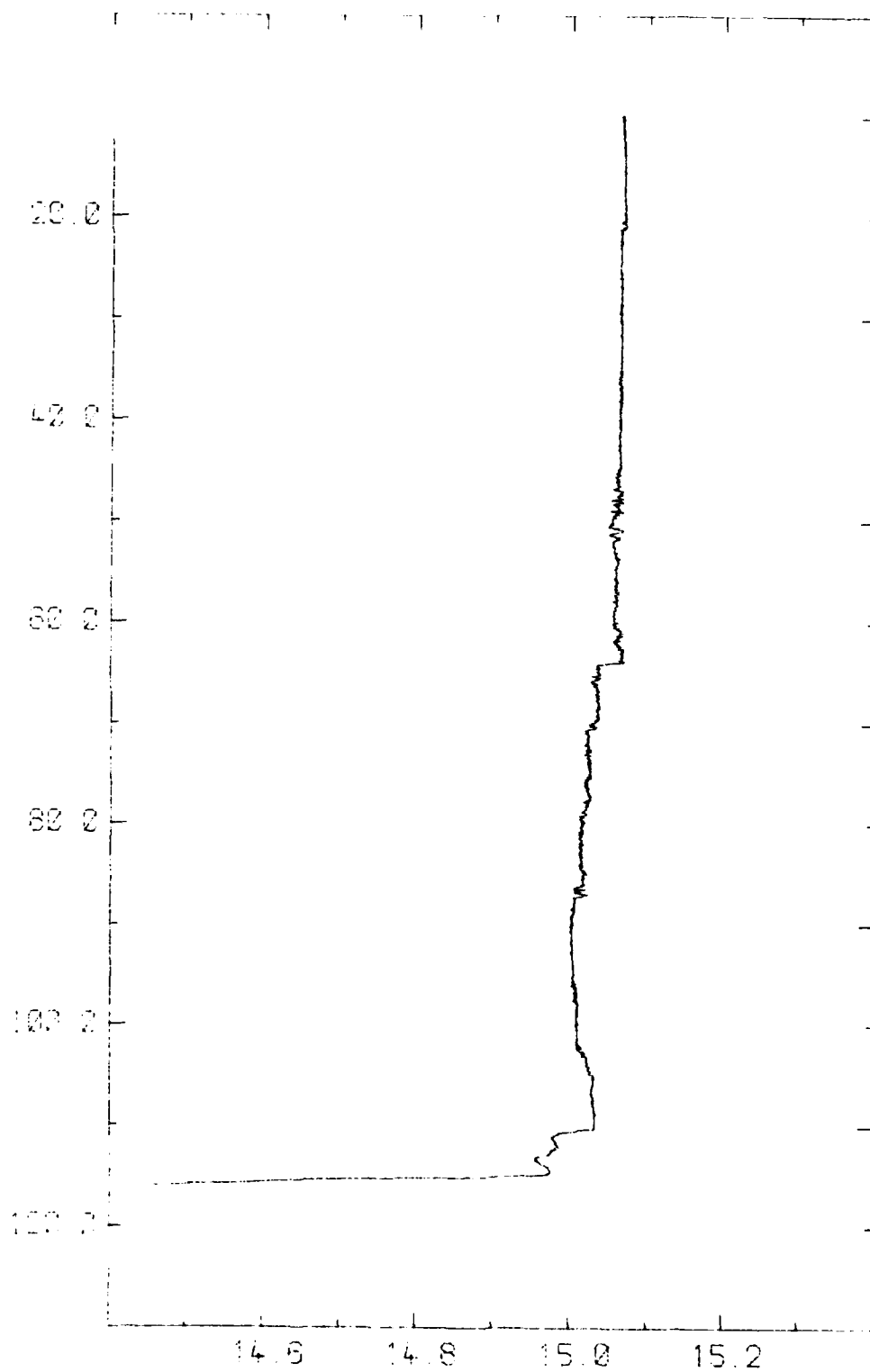
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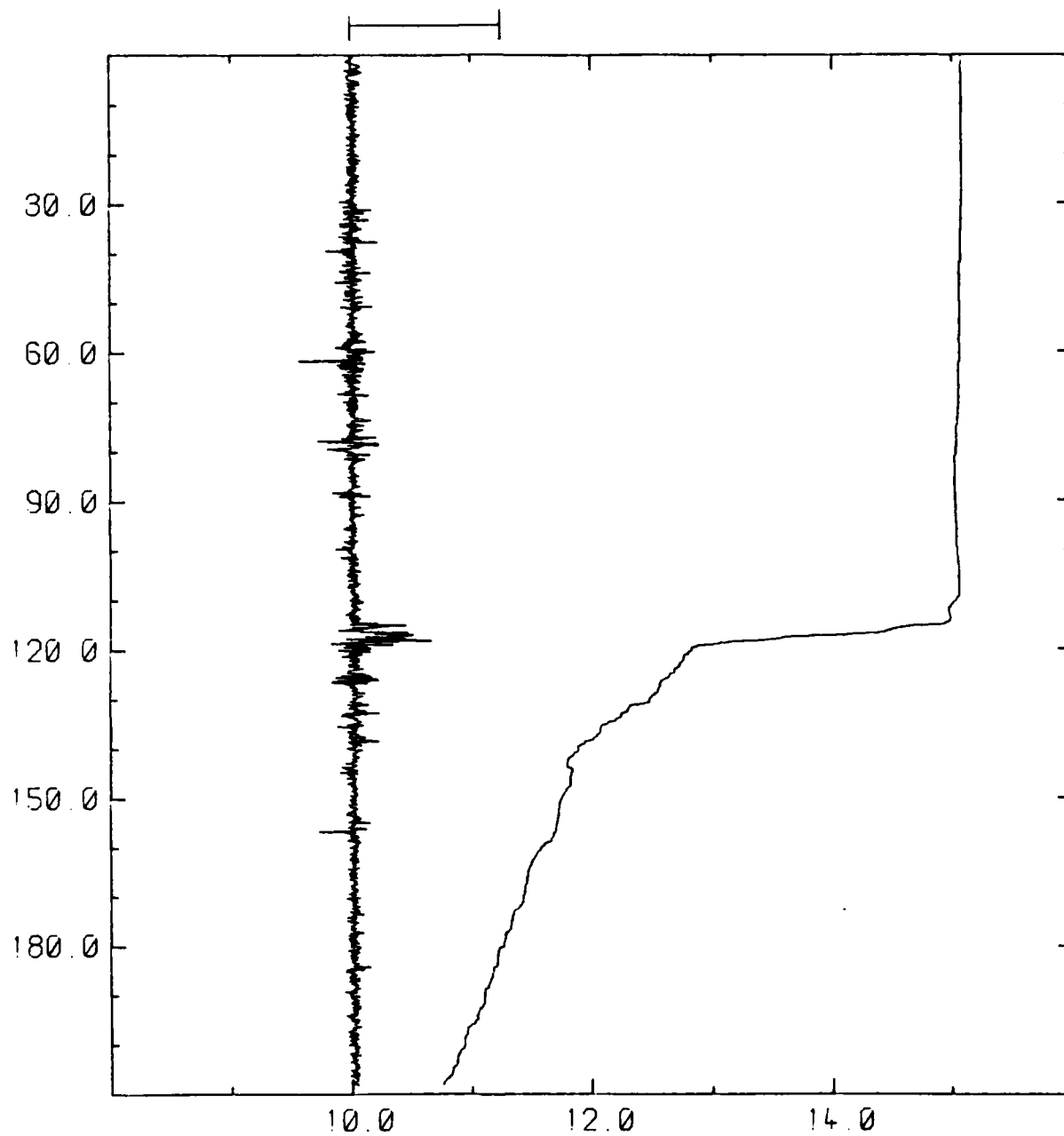
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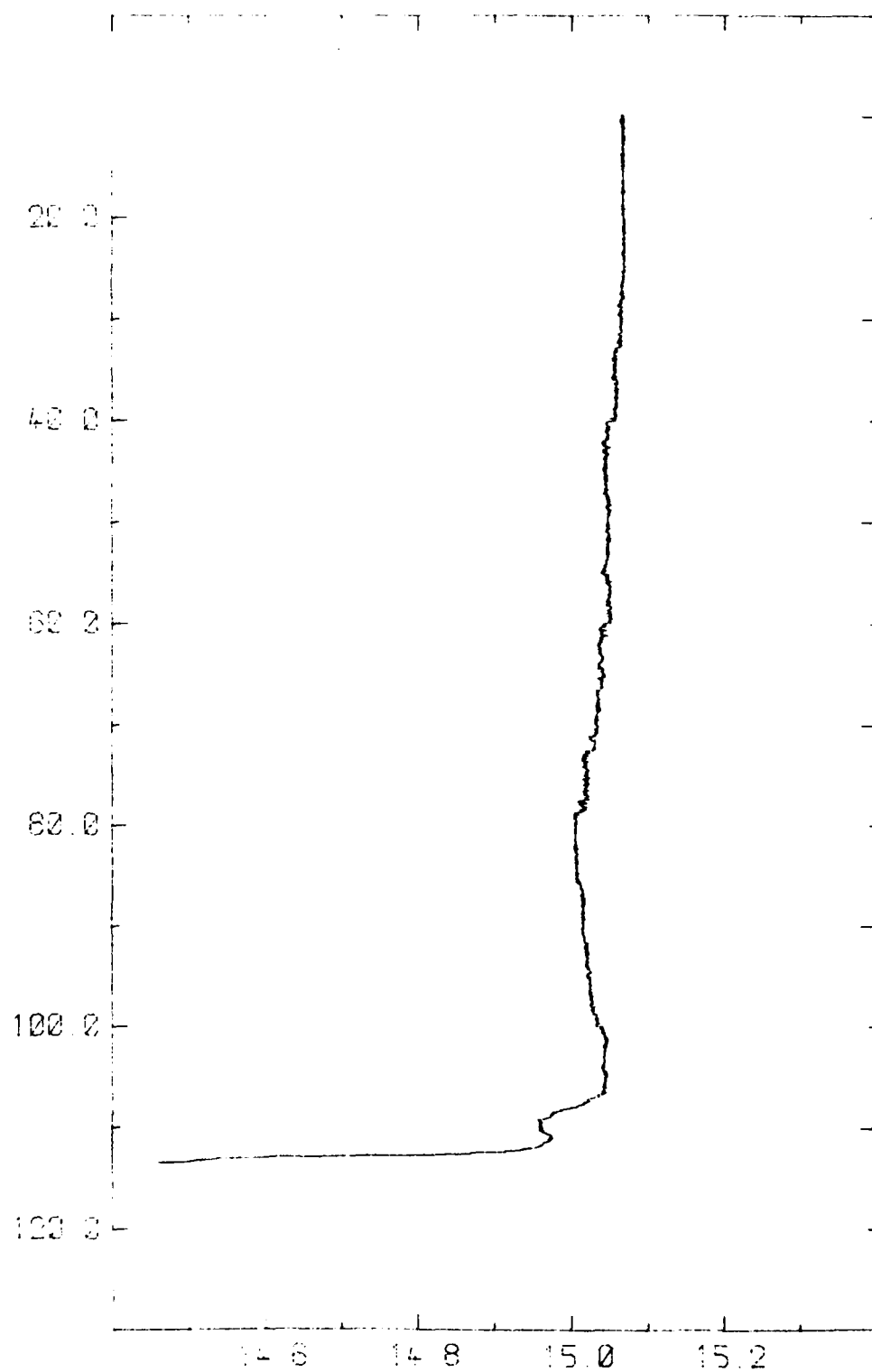
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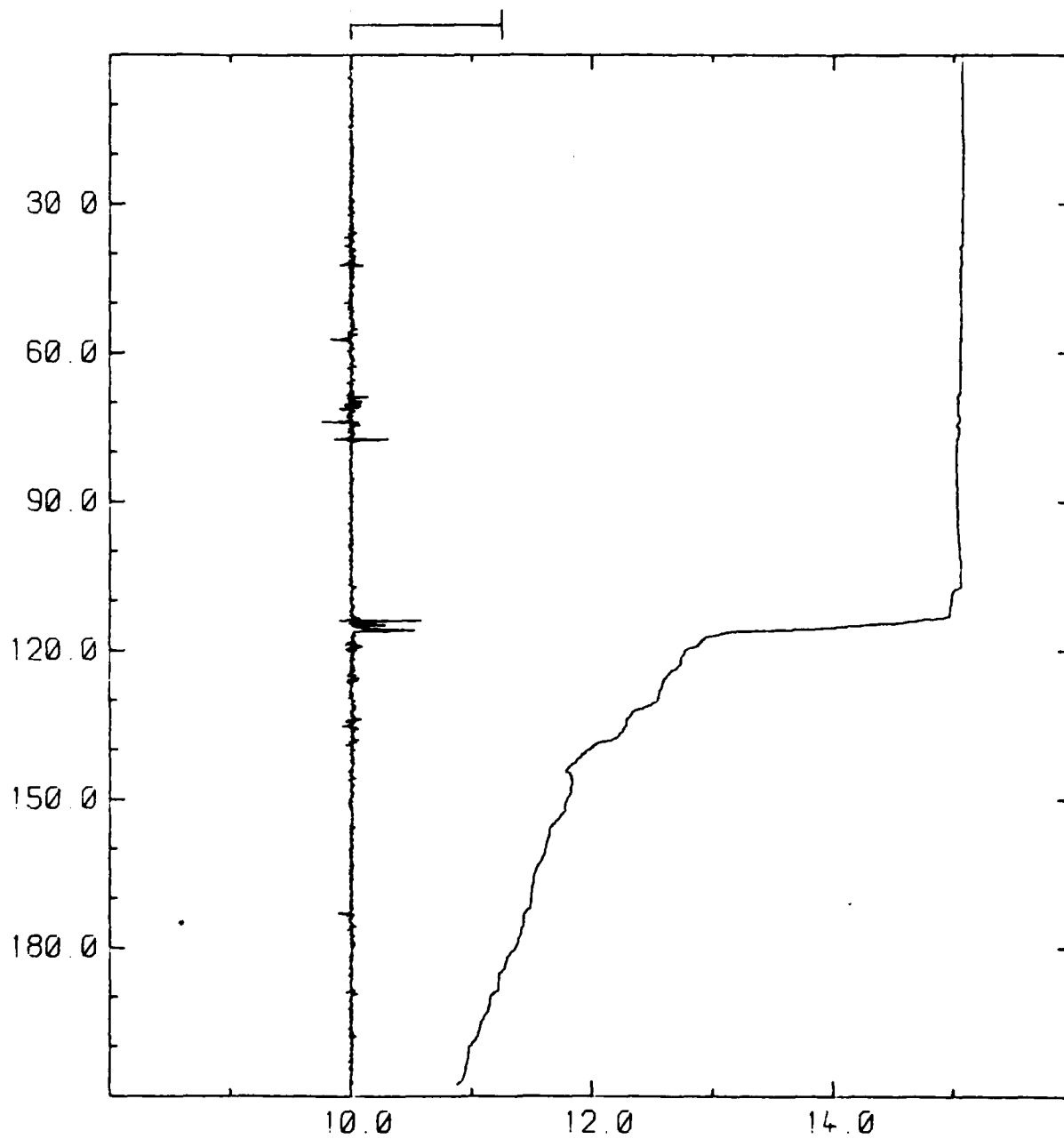
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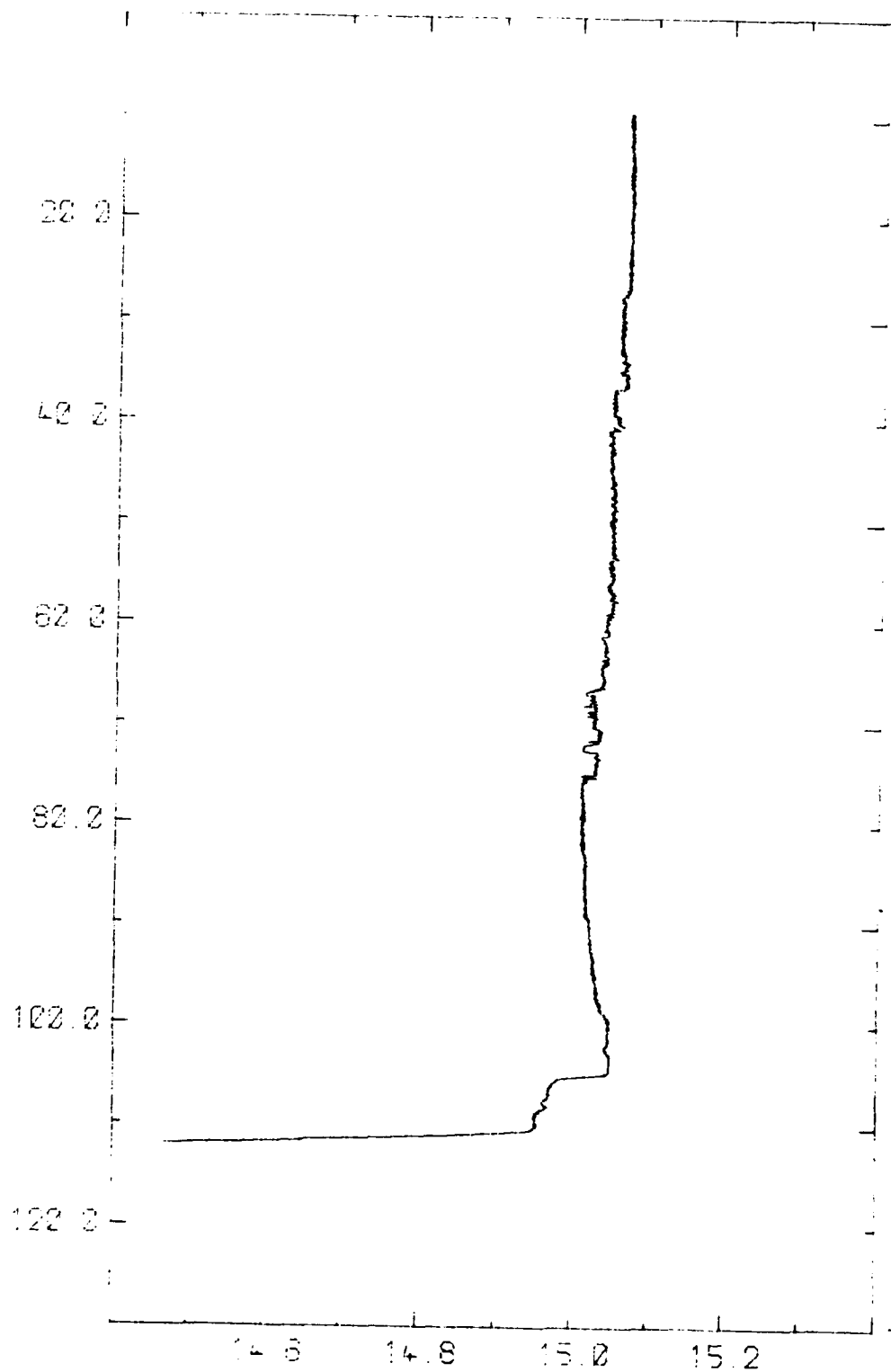
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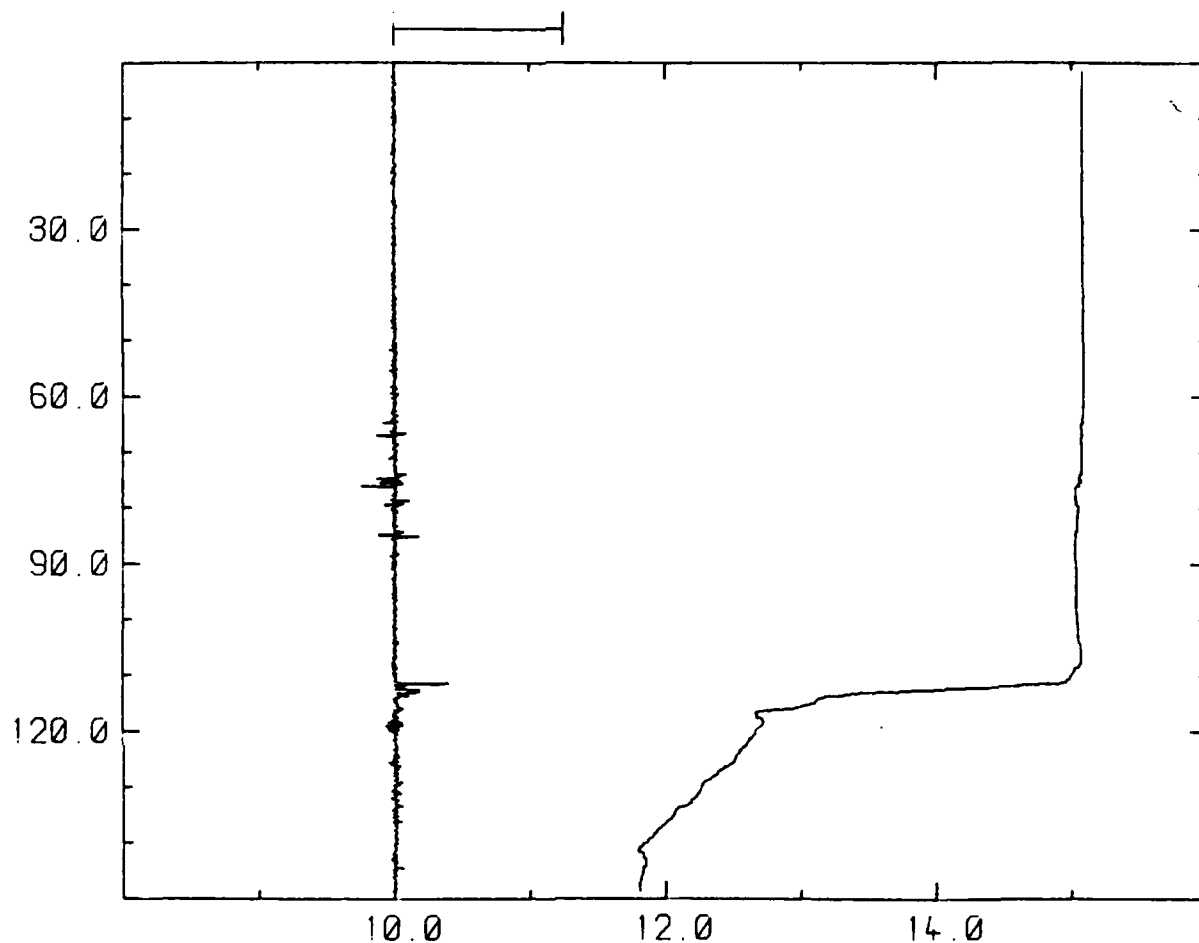
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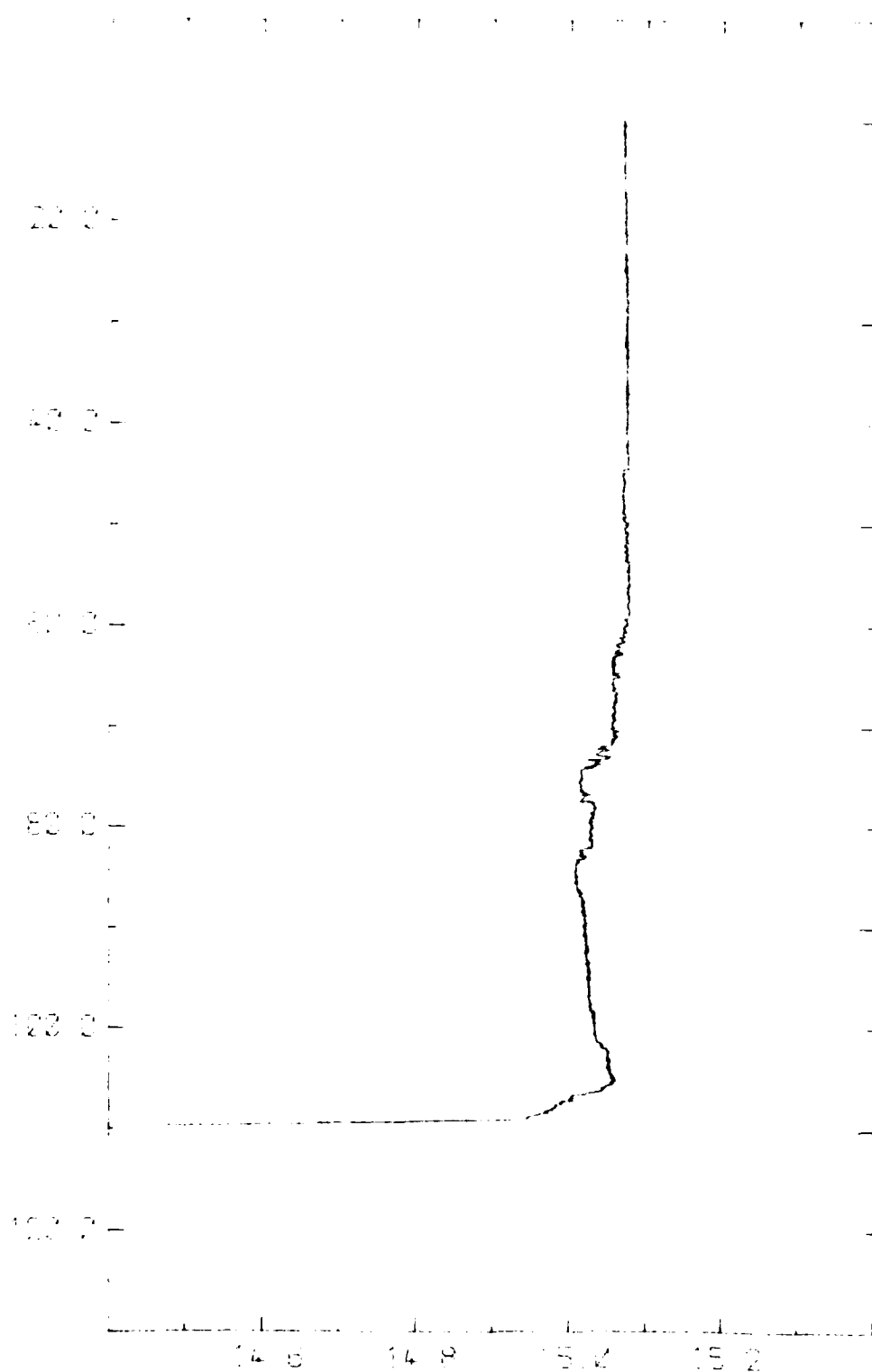
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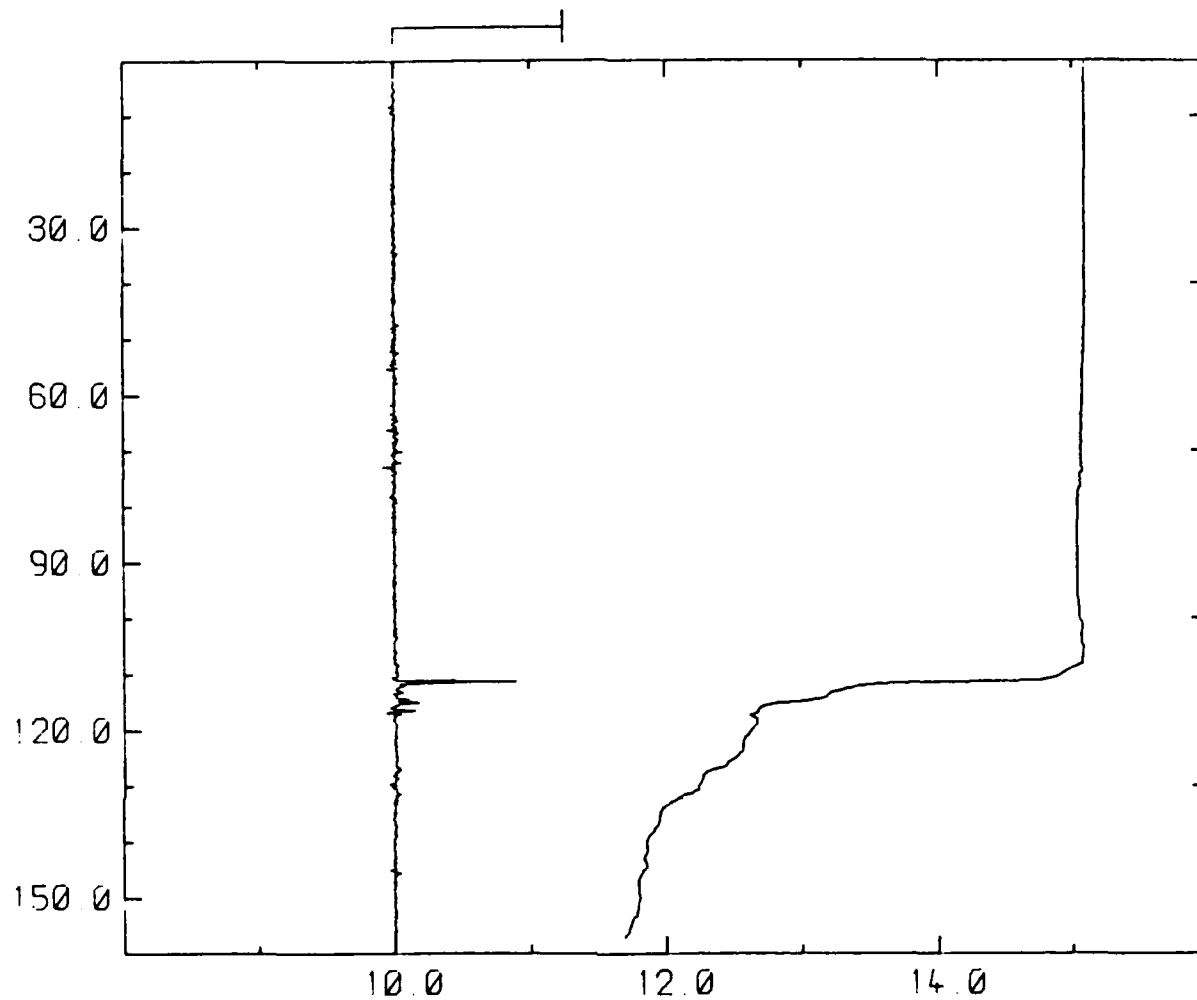
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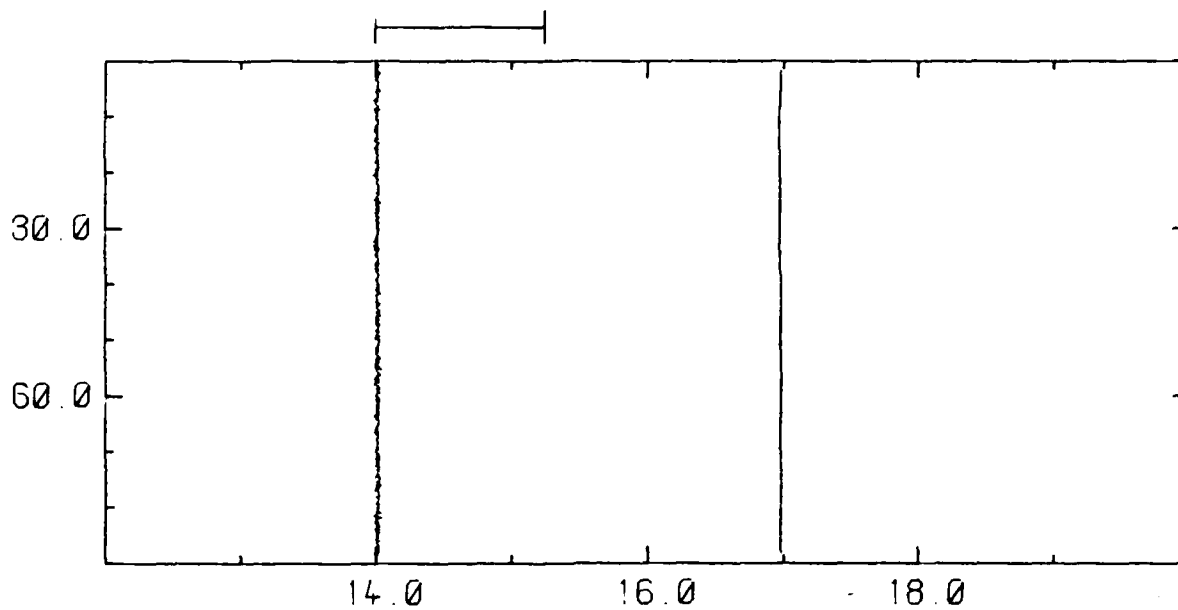
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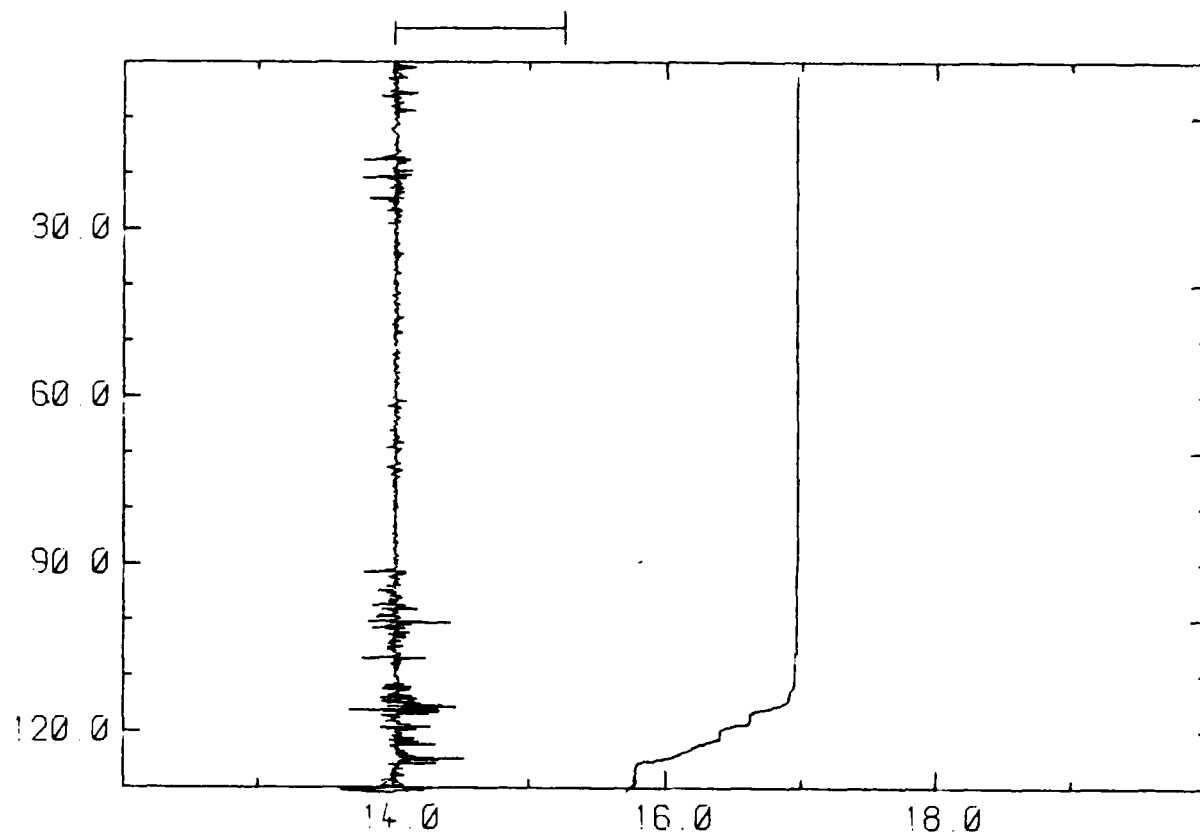
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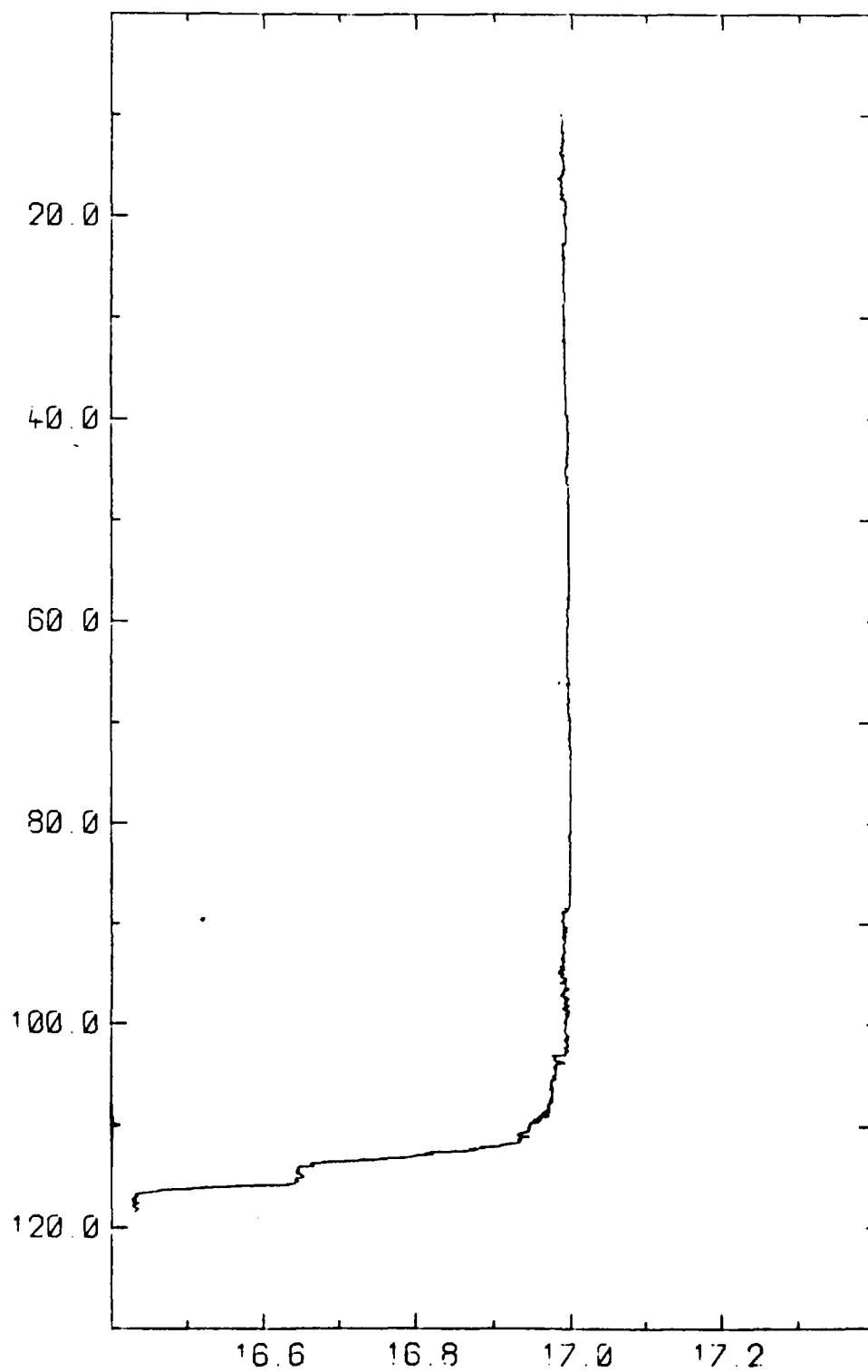
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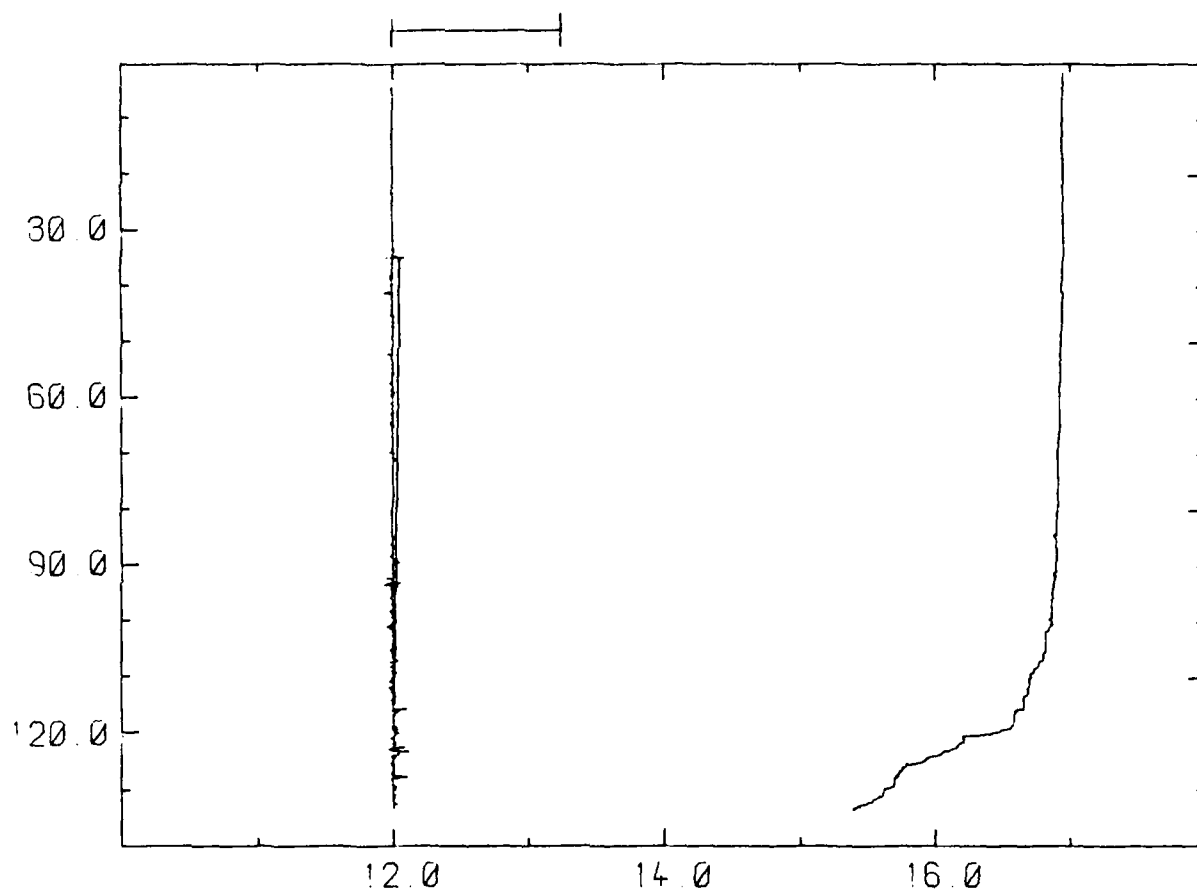


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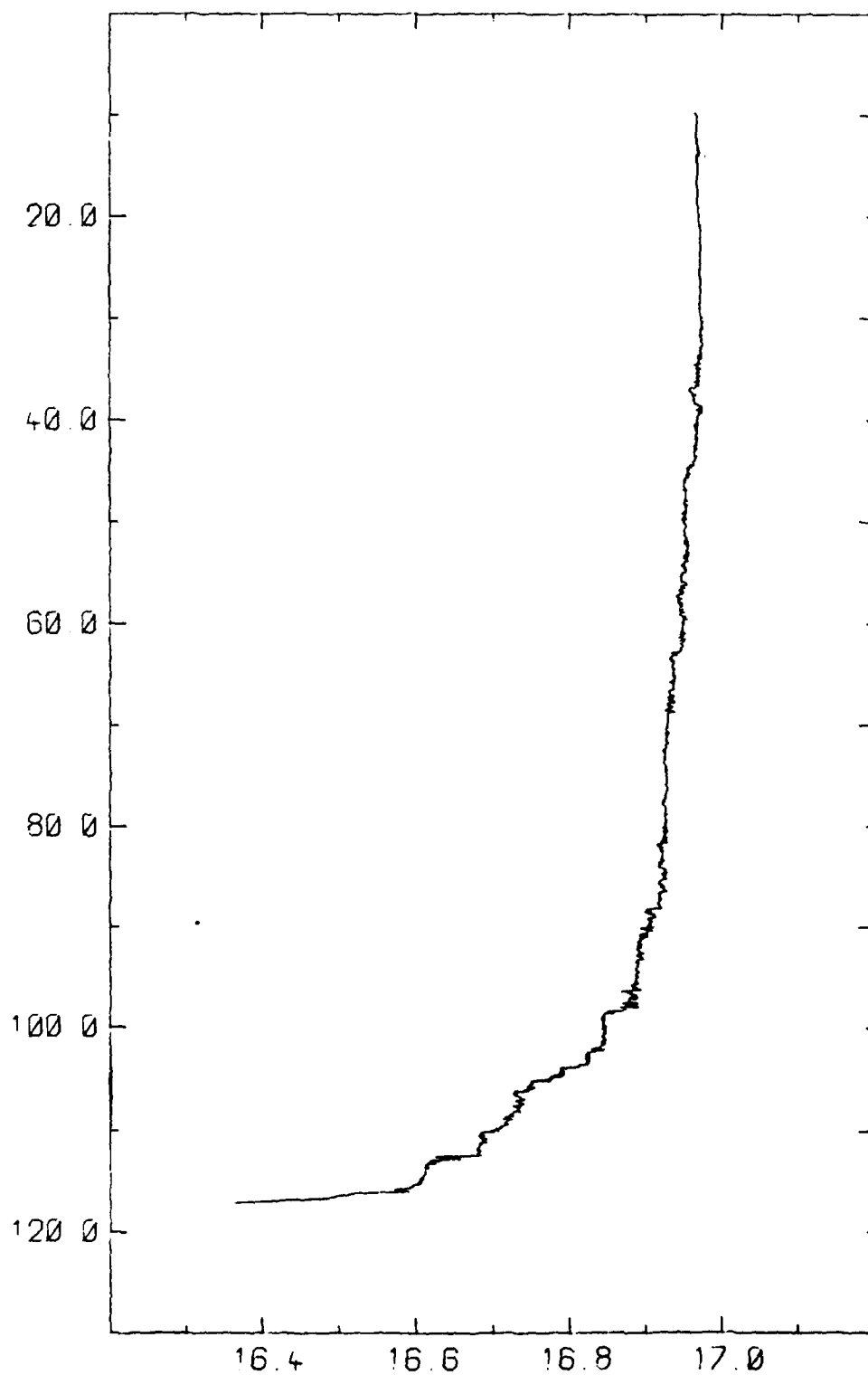
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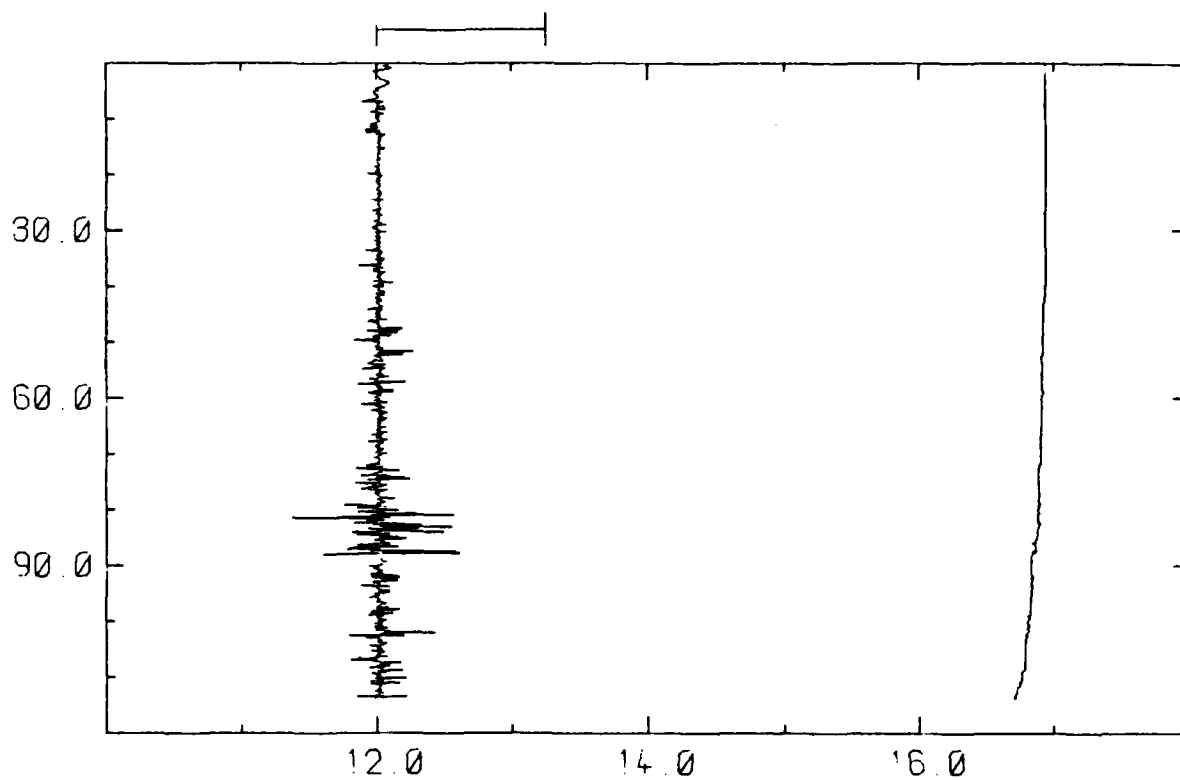


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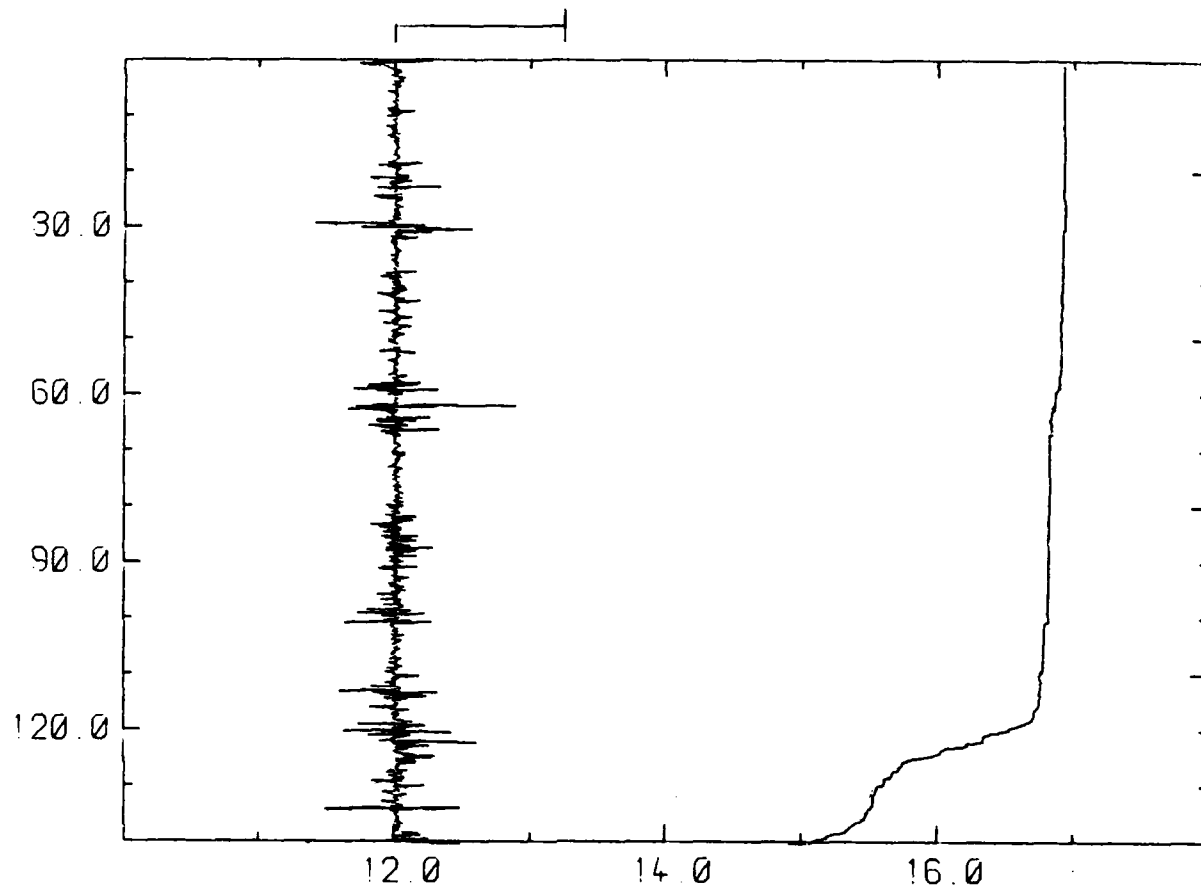


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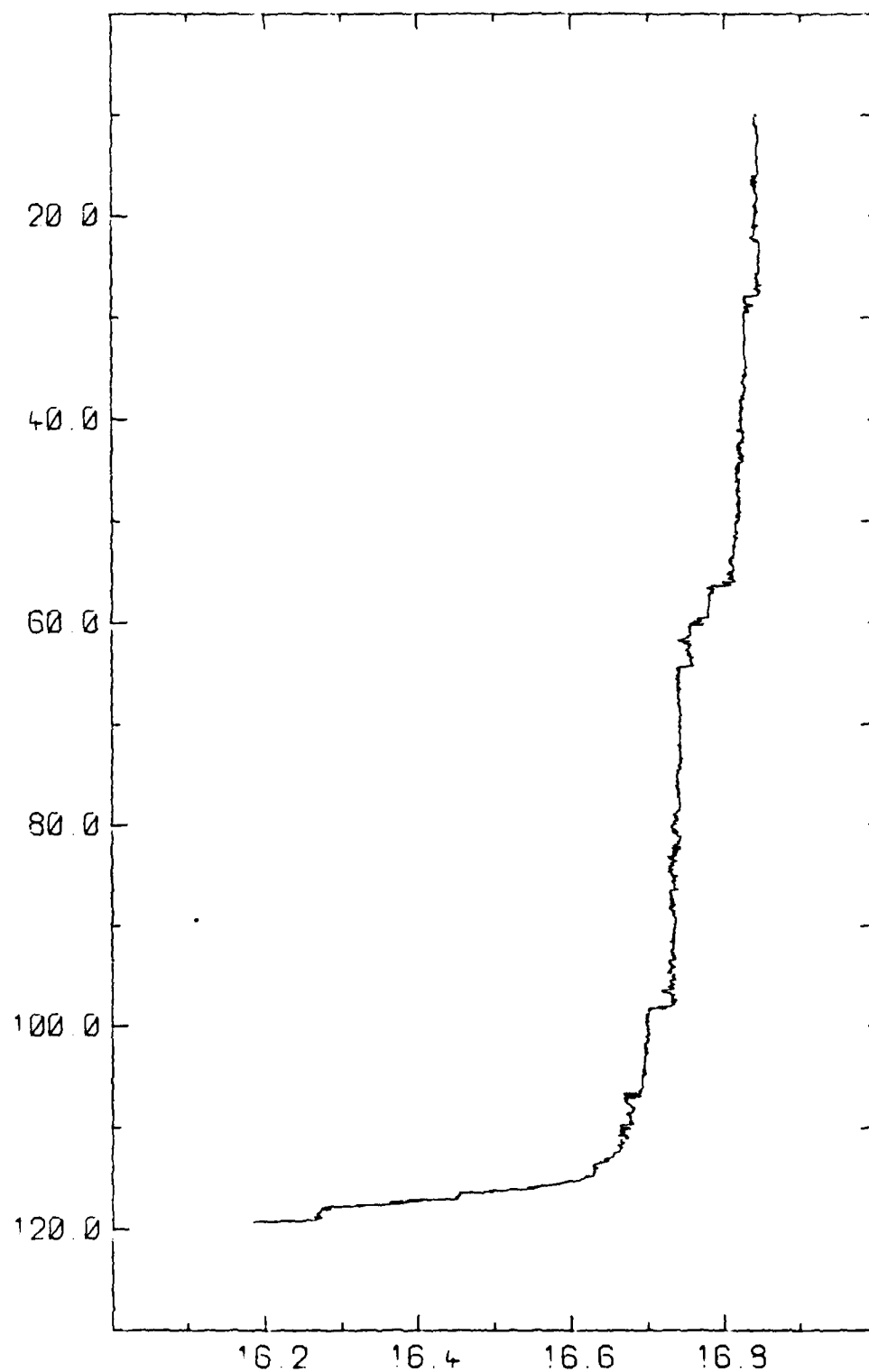


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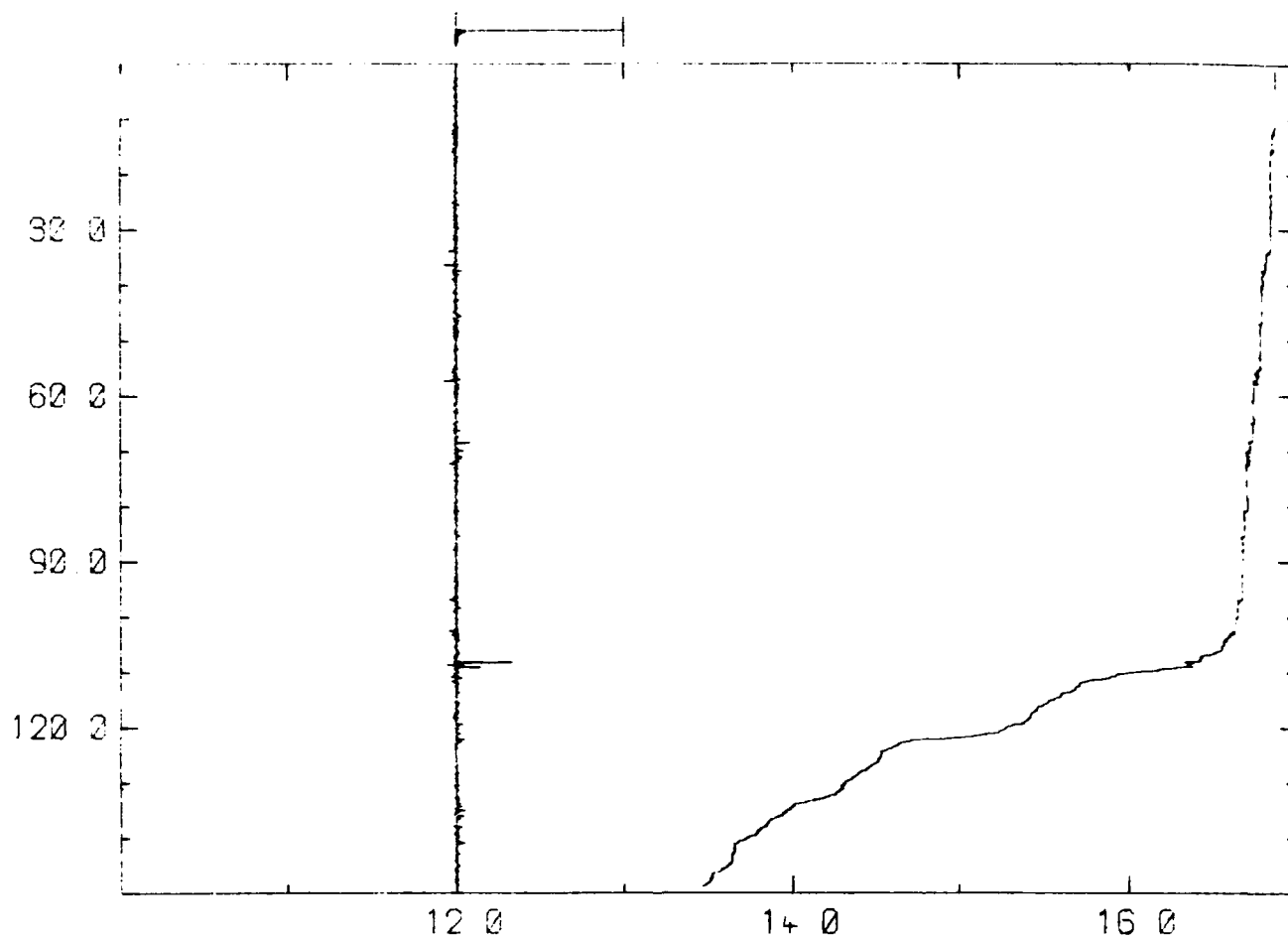
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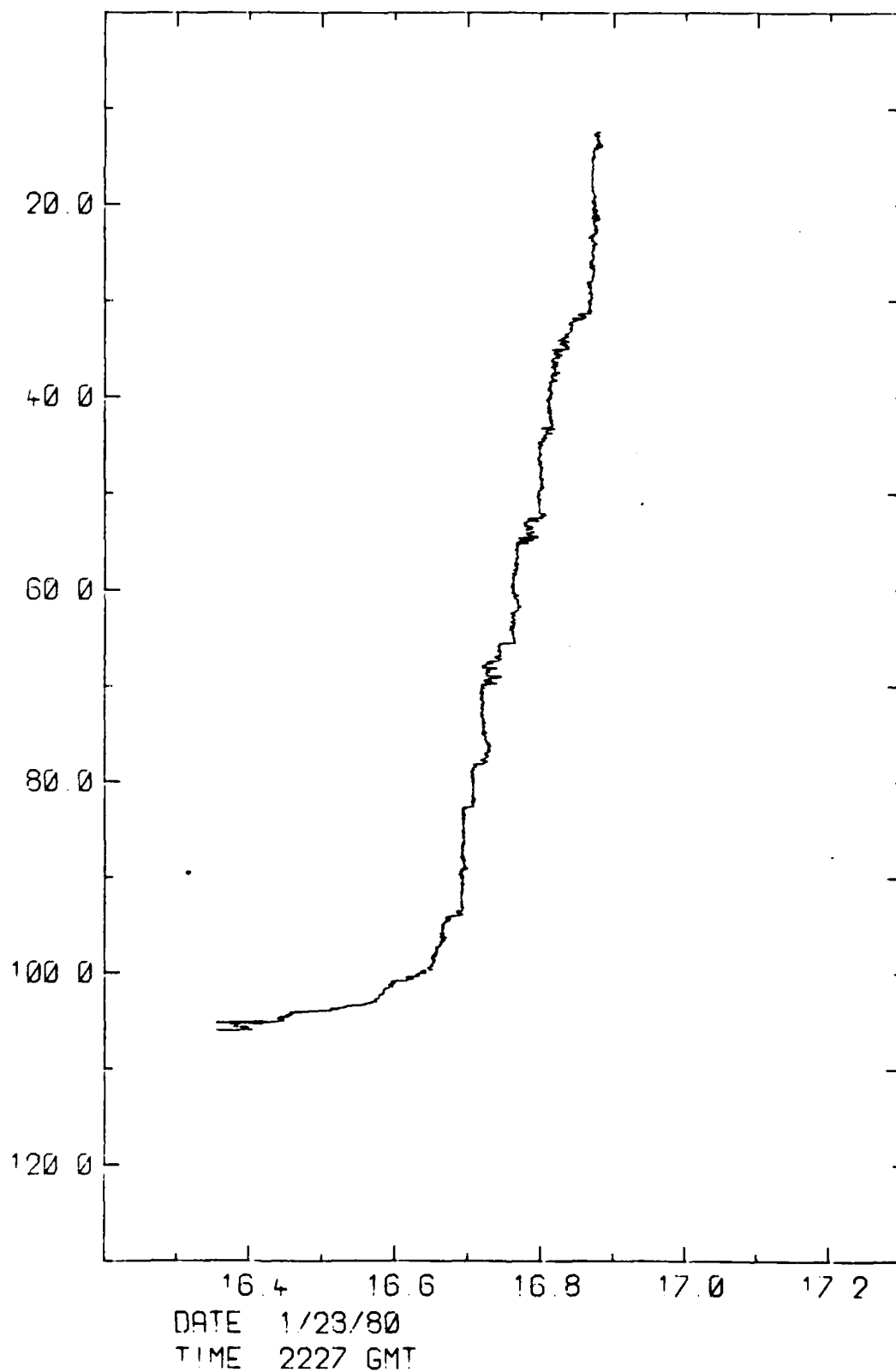
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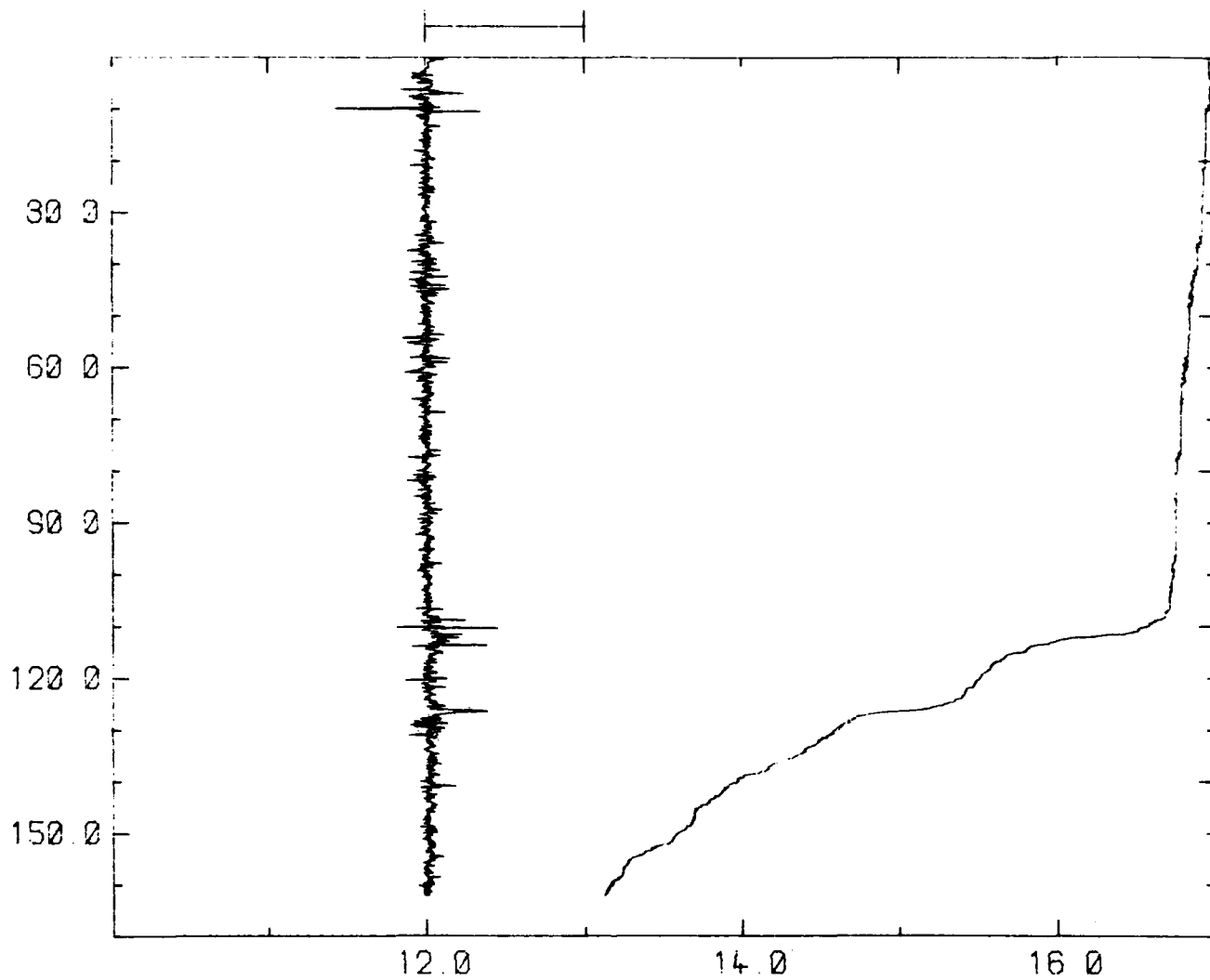




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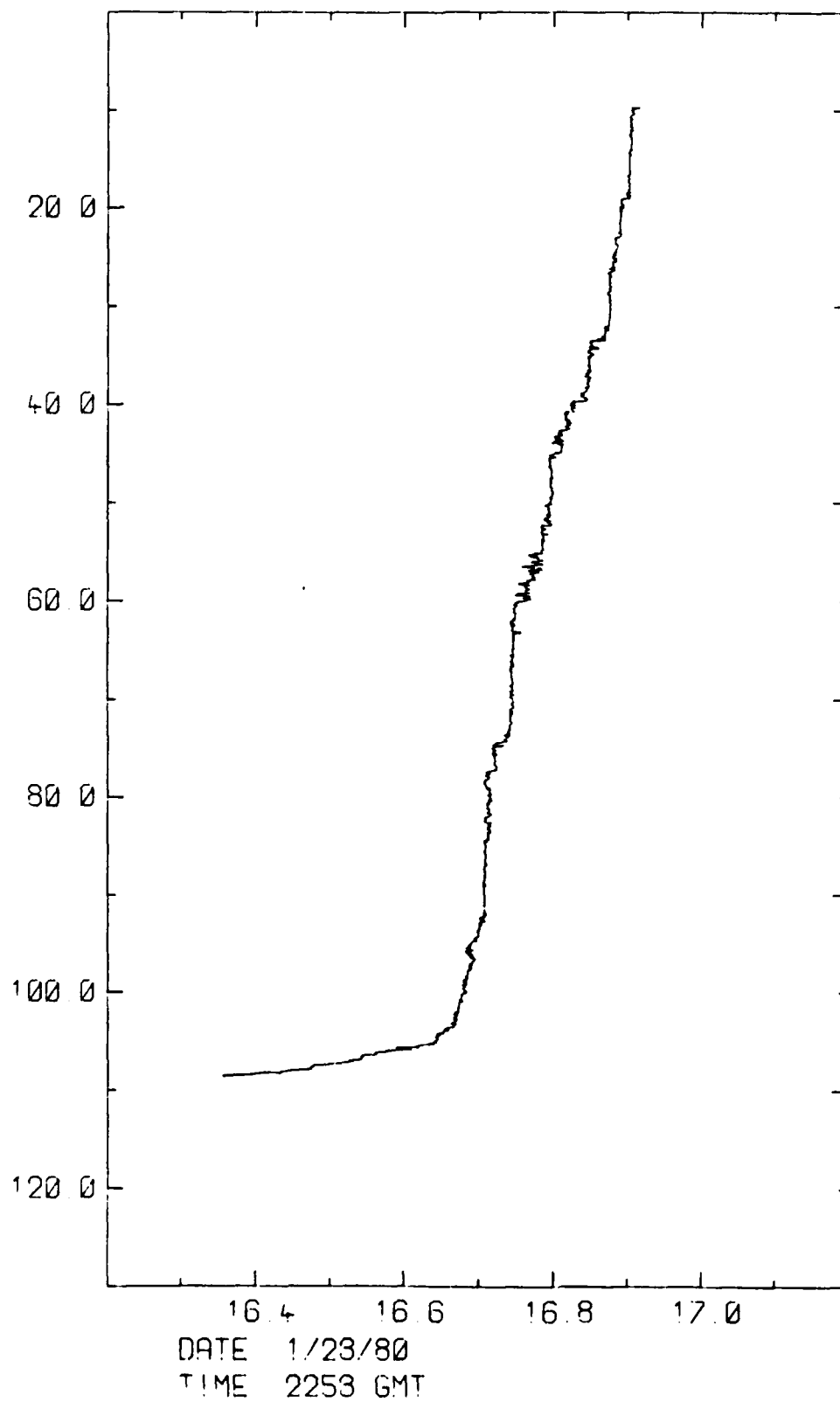
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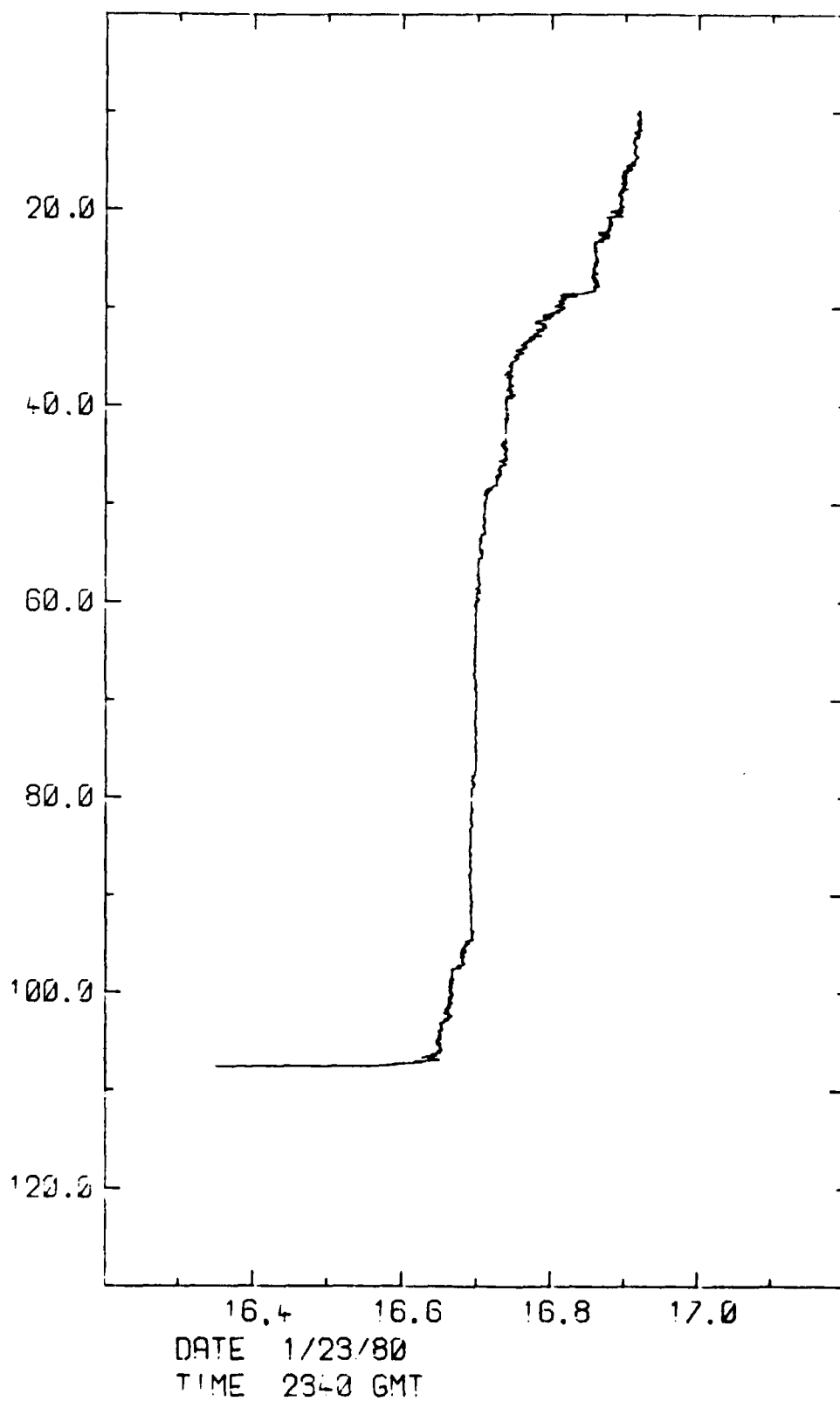
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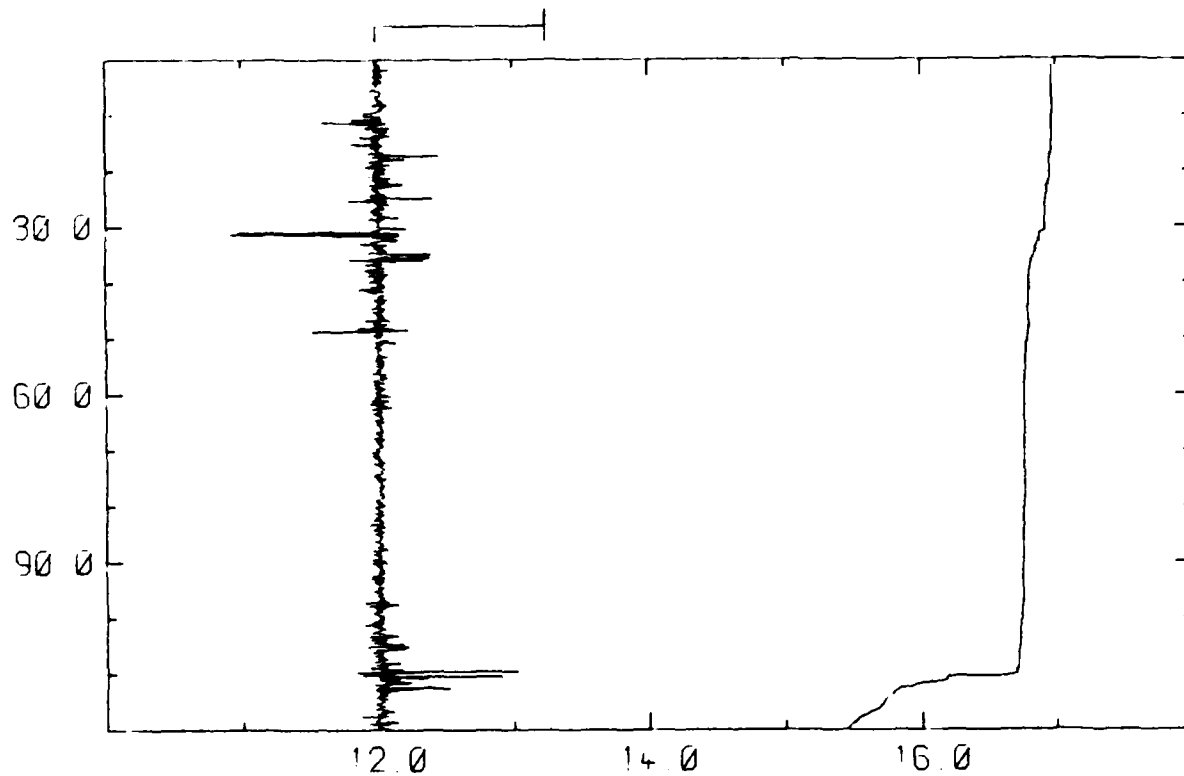
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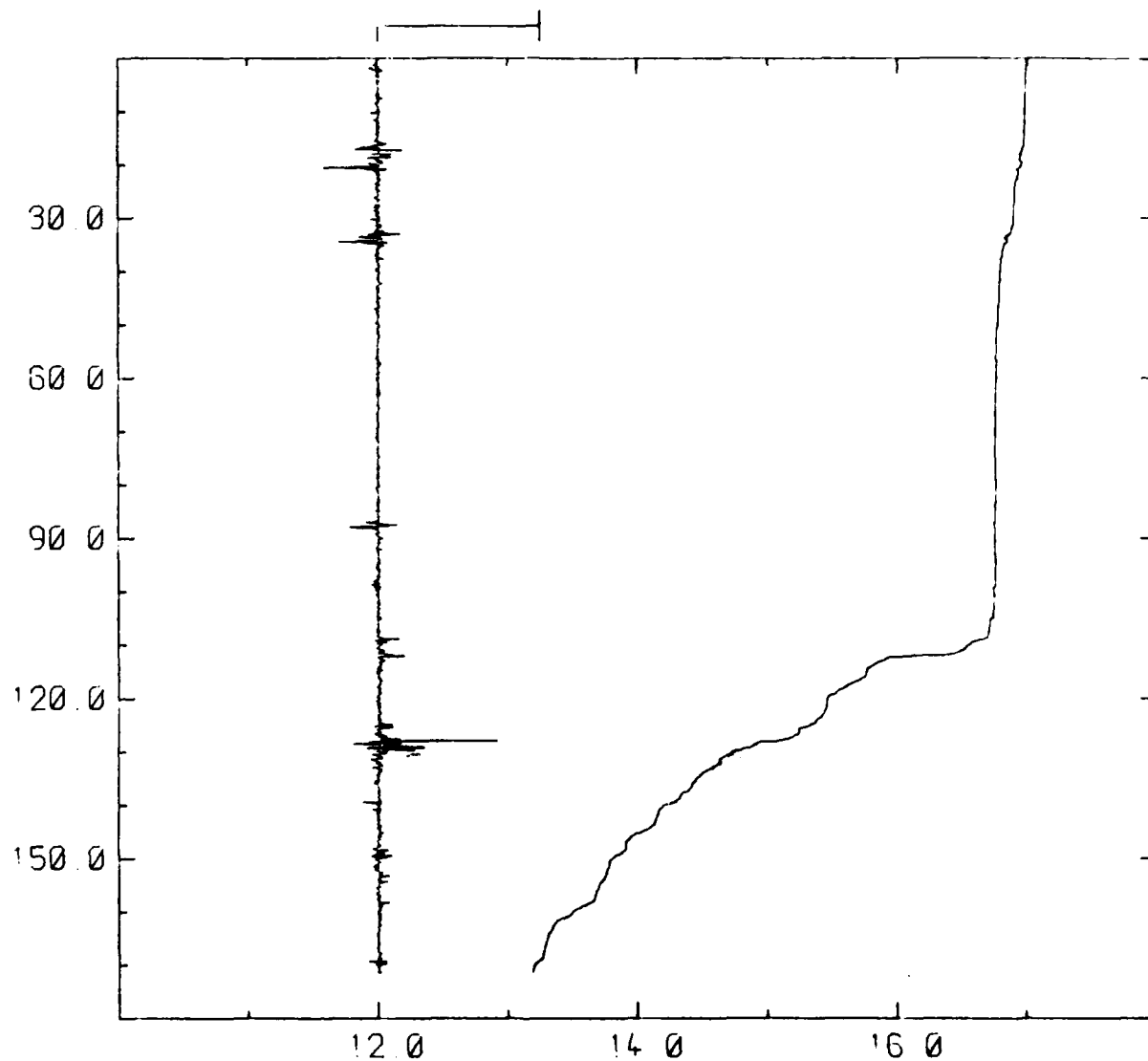
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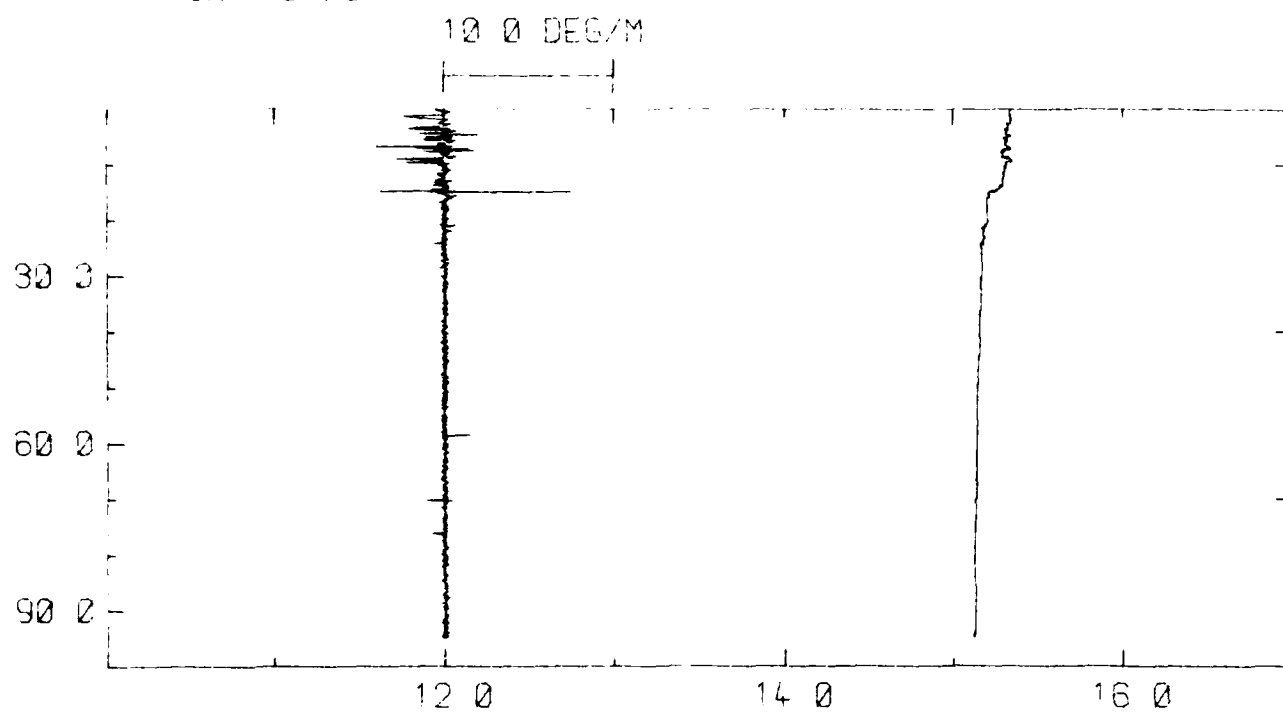
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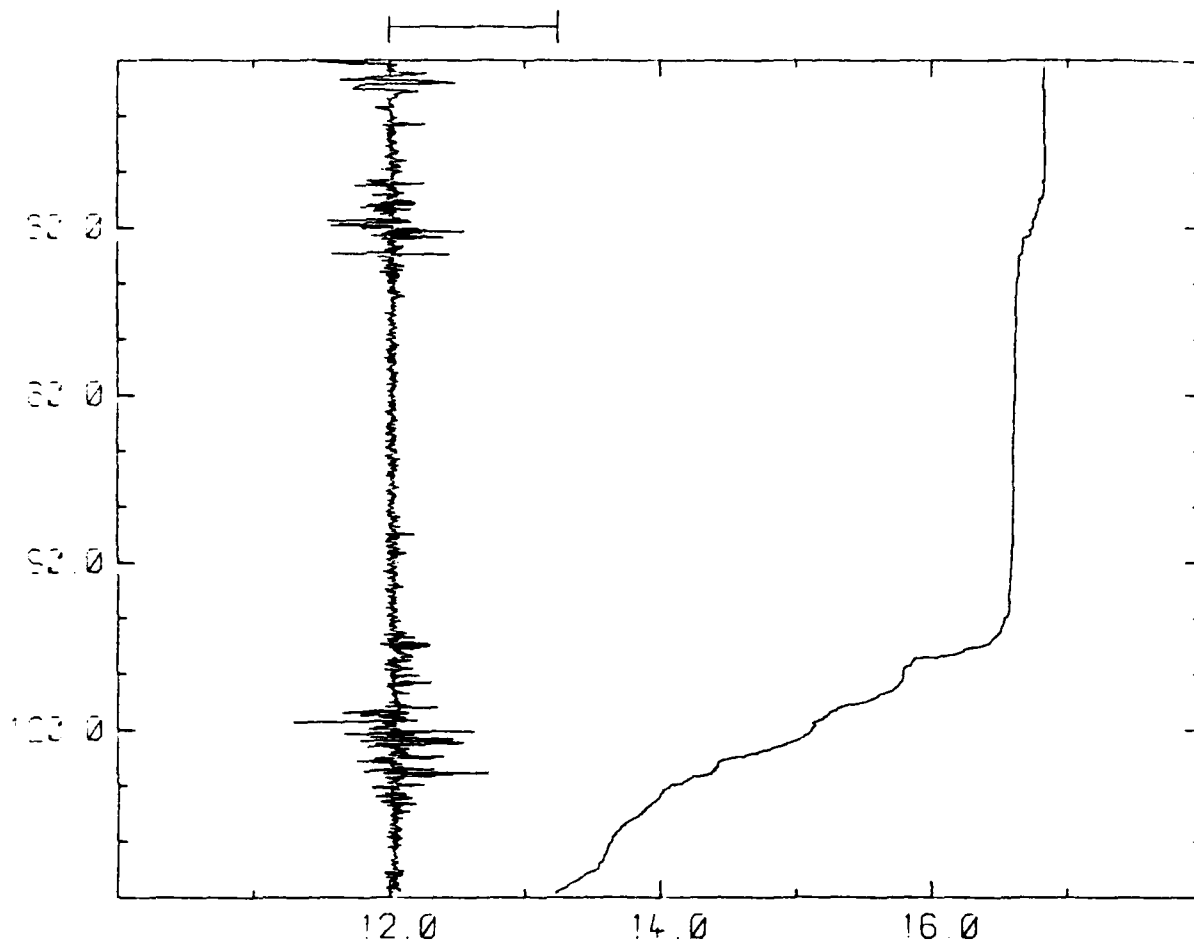
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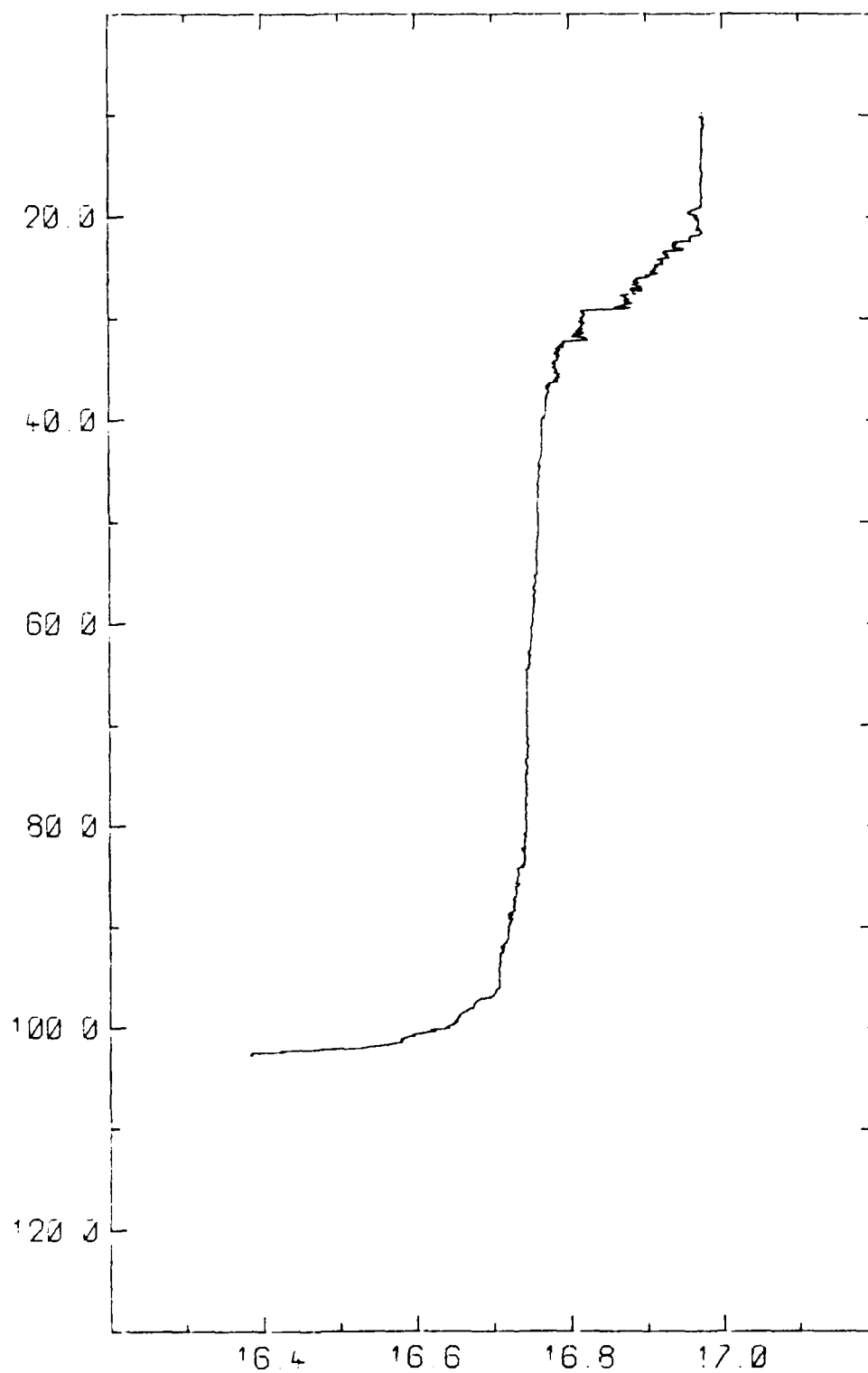
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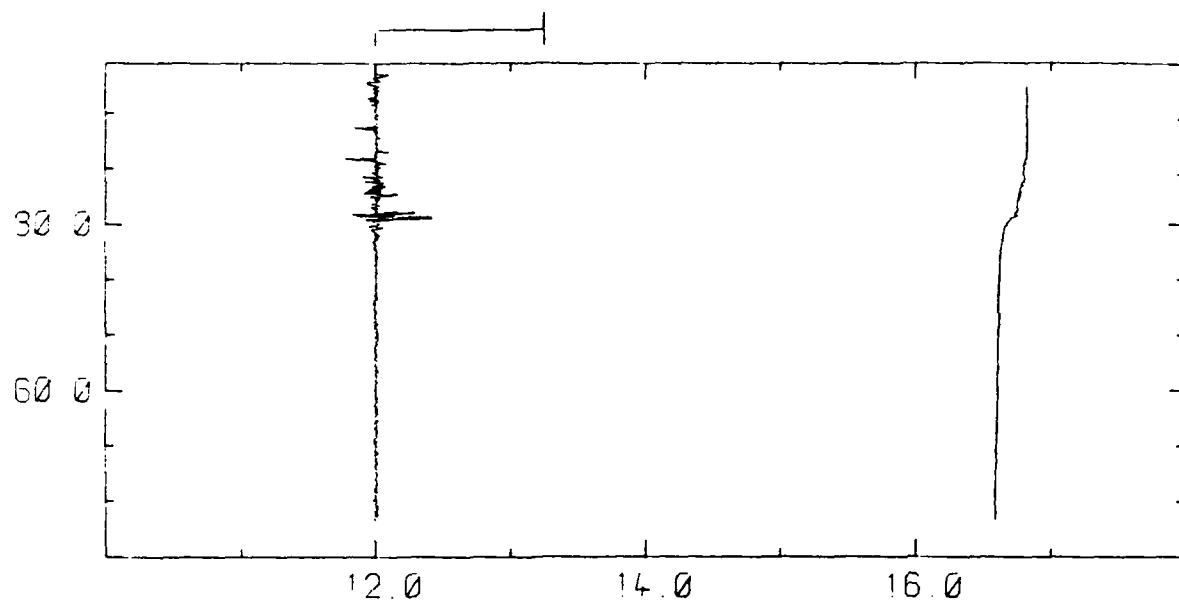


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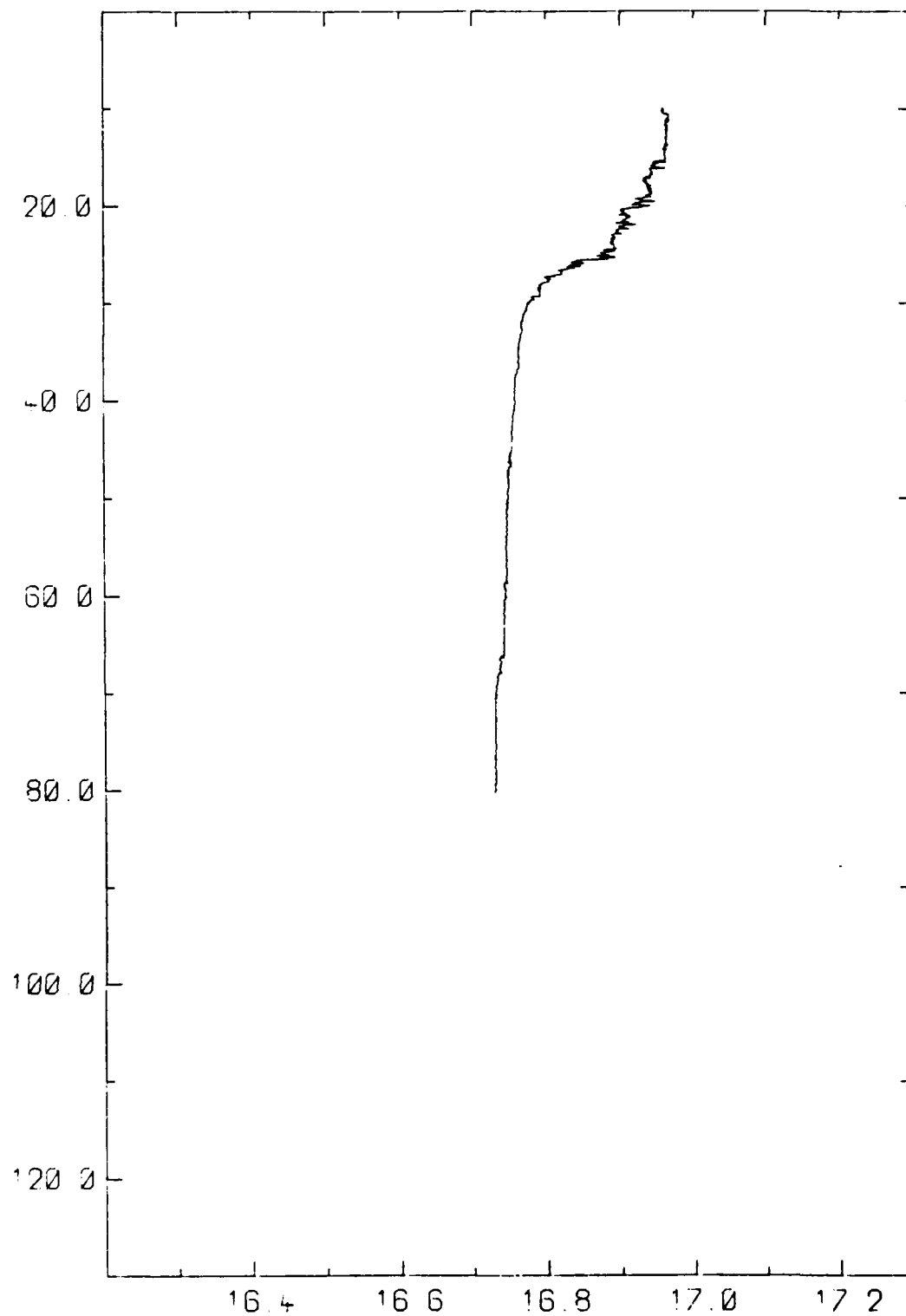
10.0 DEG/M



DATE 1/24/80  
TIME 0327 GMT

TAPE F2F    FILE 3  
UNIT 2.79

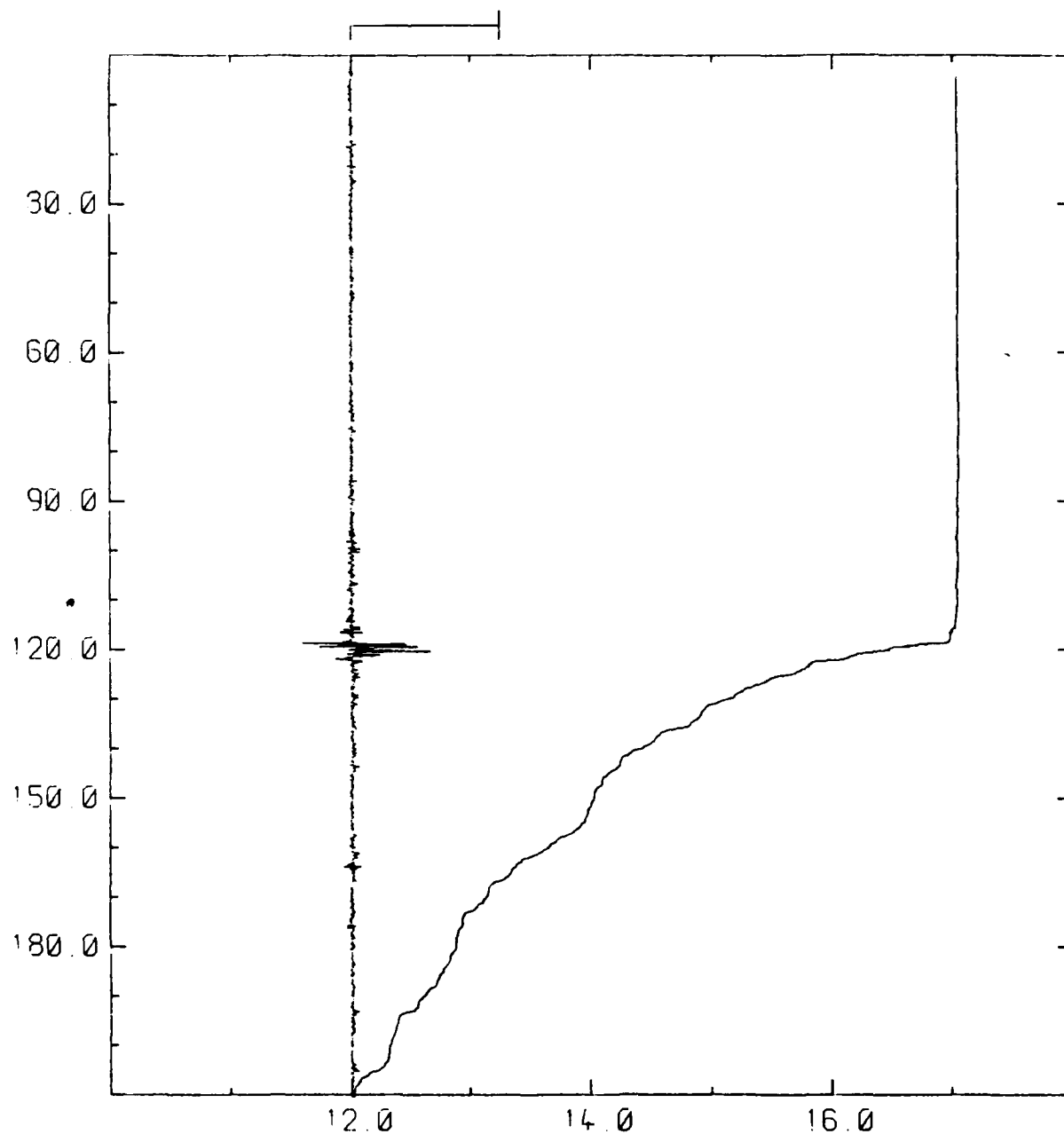
51



DATE 1/24/80  
TIME 0327 GMT

TAPE F3A FILE 1  
UNIT 2 79

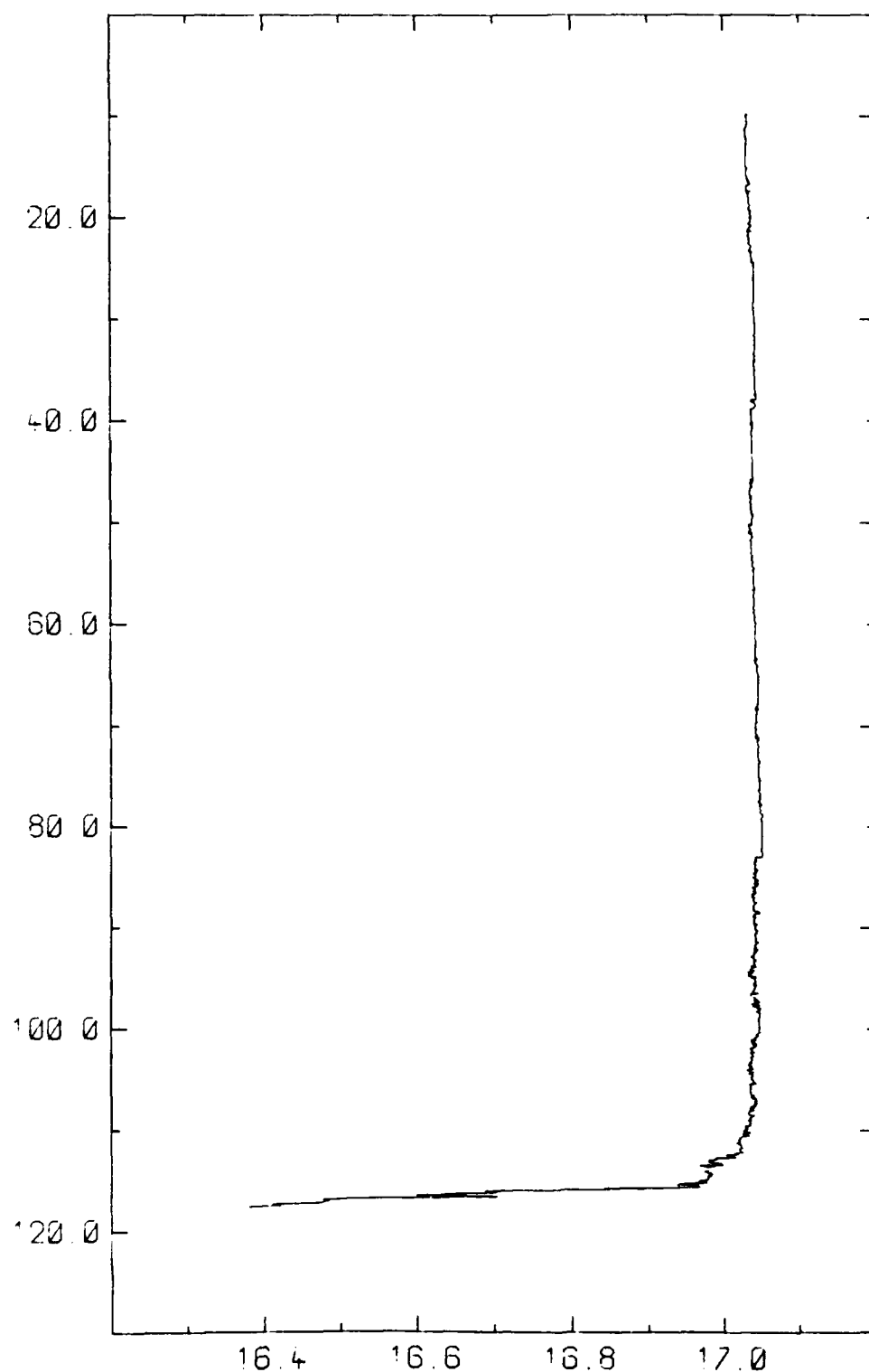
10.0 DEG/M



DATE 1/24/80  
TIME 1903 GMT

TAPE F3A    FILE 1  
UNIT 2 79

53

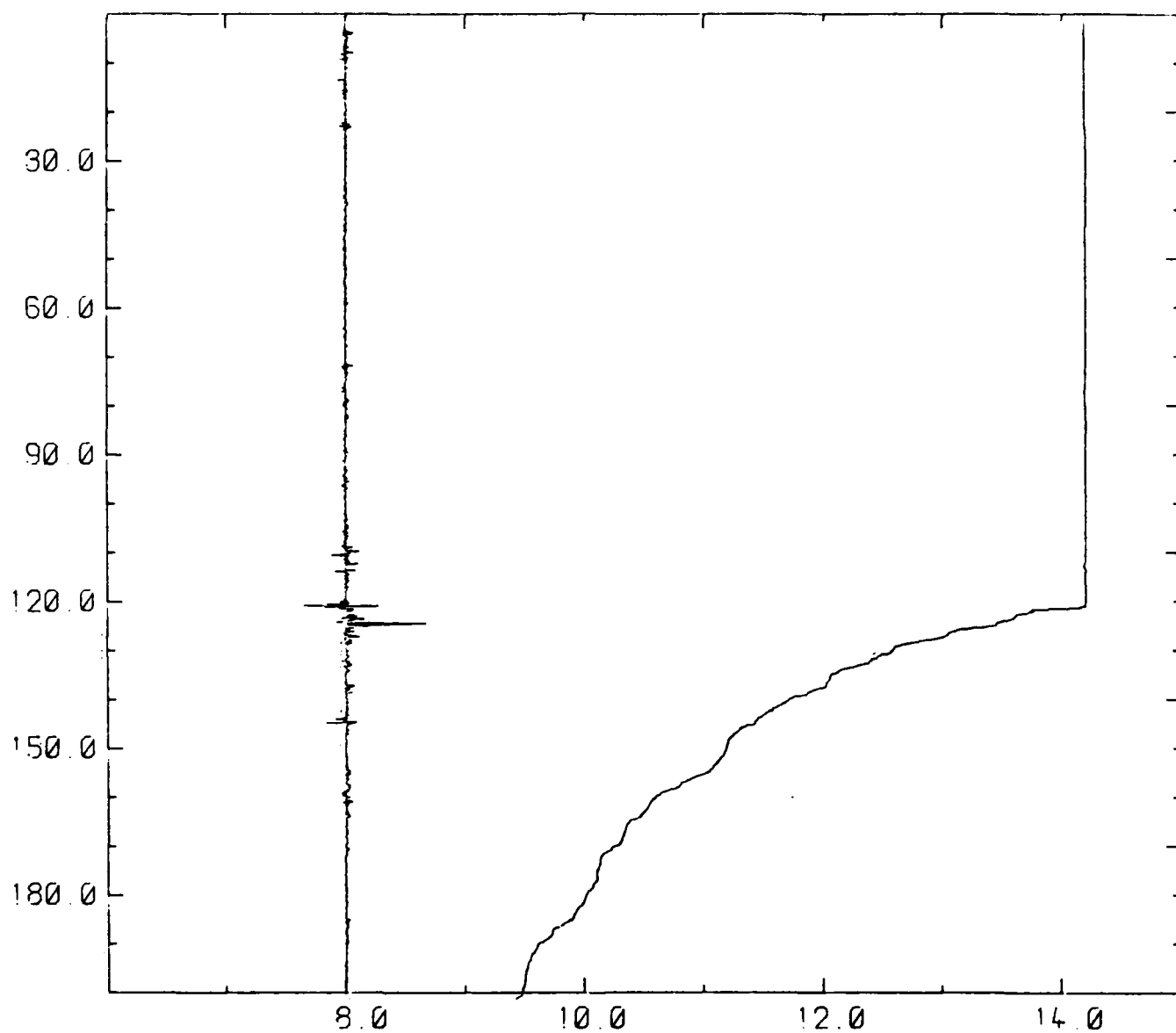


DATE 1/24/80  
TIME 1903 GMT

54

TAPE F3B FILE 1  
UNIT 5.79

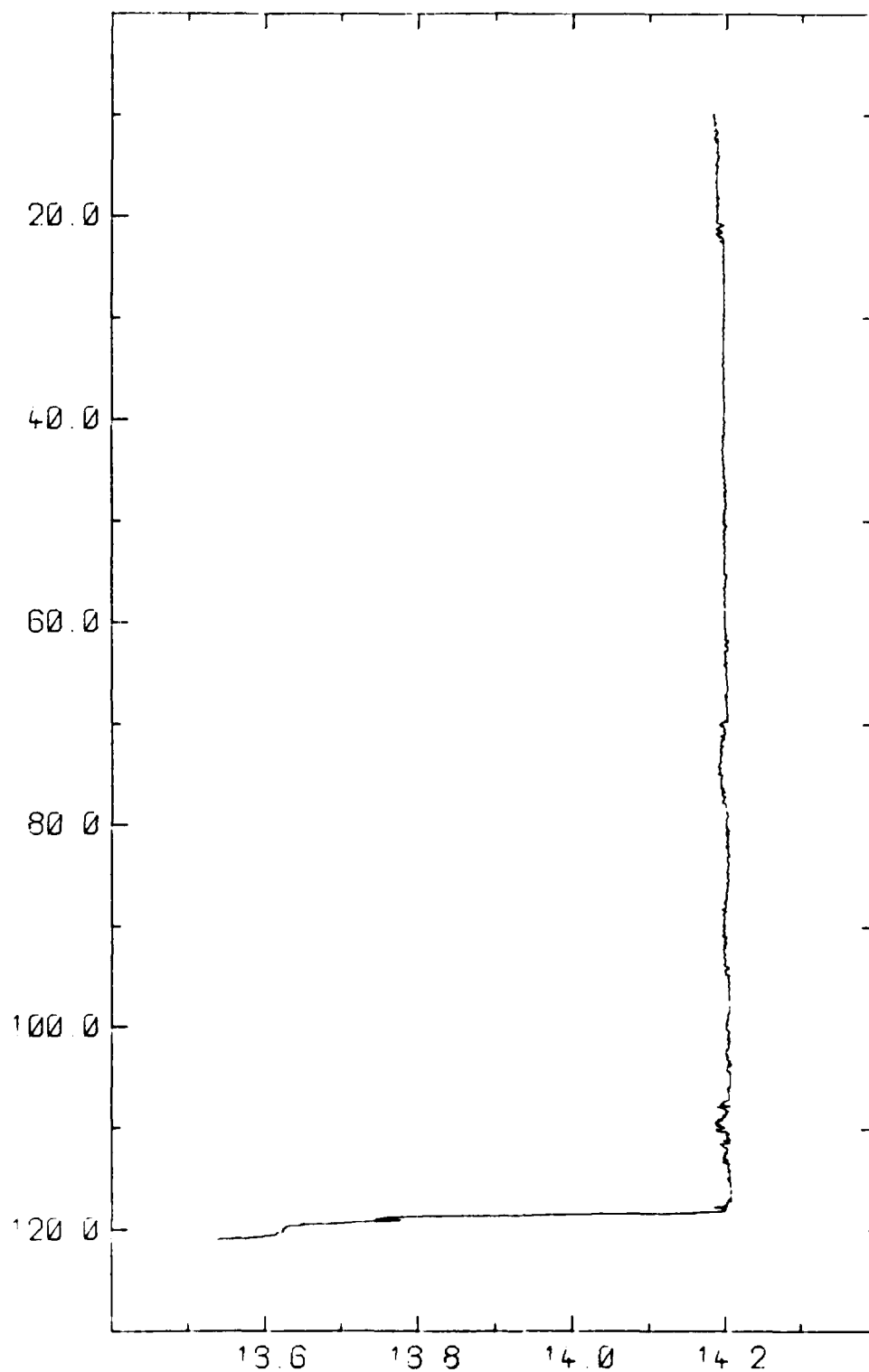
10.0 DEG/M



DATE 1/24/80  
TIME 1949 GMT

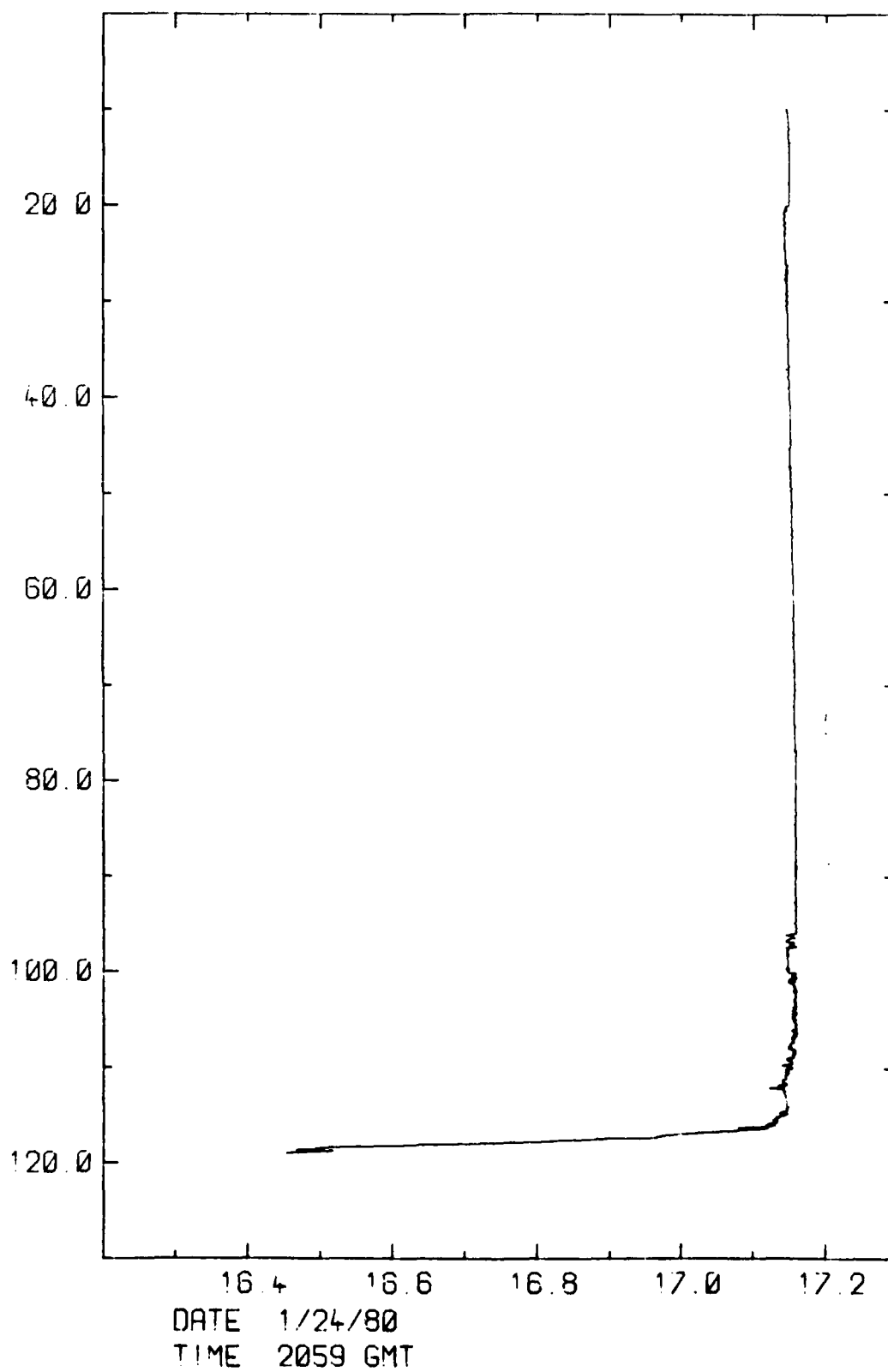
TAPE F3B    FILE 1  
UNIT 5 79

55



DATE 1/24/80  
TIME 1949 GMT

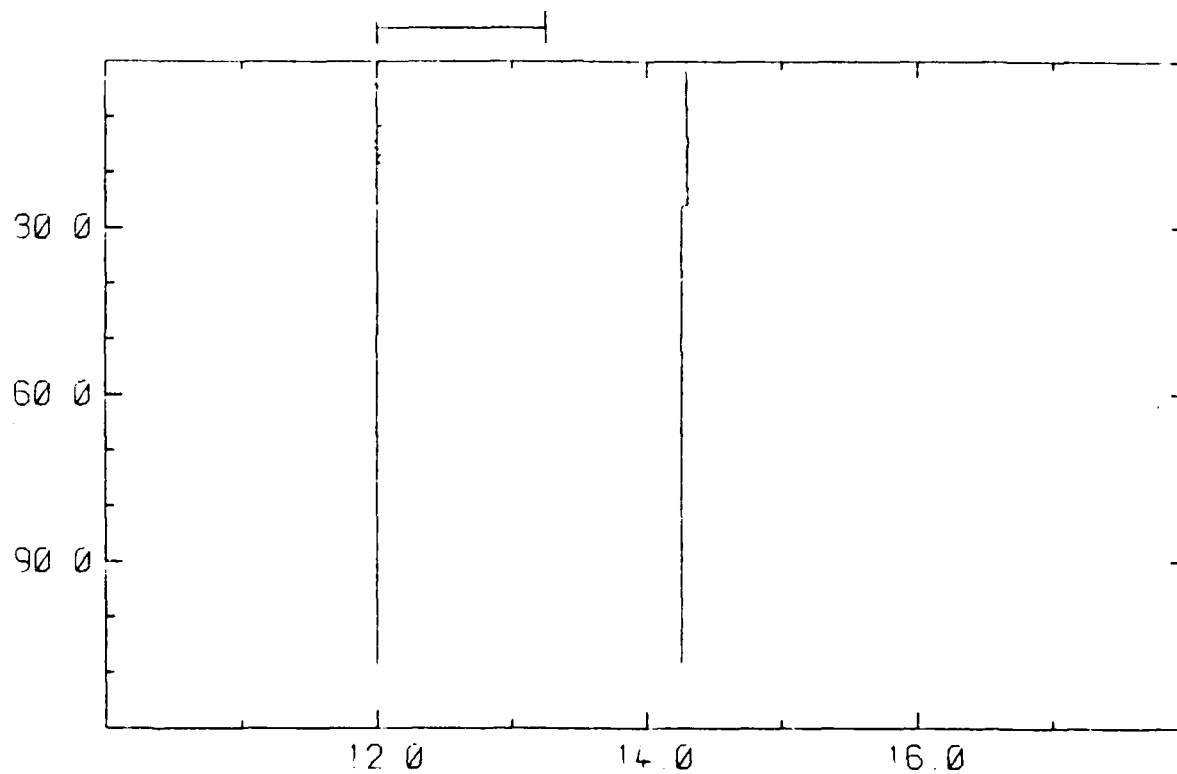
TAPE F3C FILE 1  
UNIT 2.79



TAPE F3C FILE 2  
UNIT 5 79

57

'00 0 DEG/M

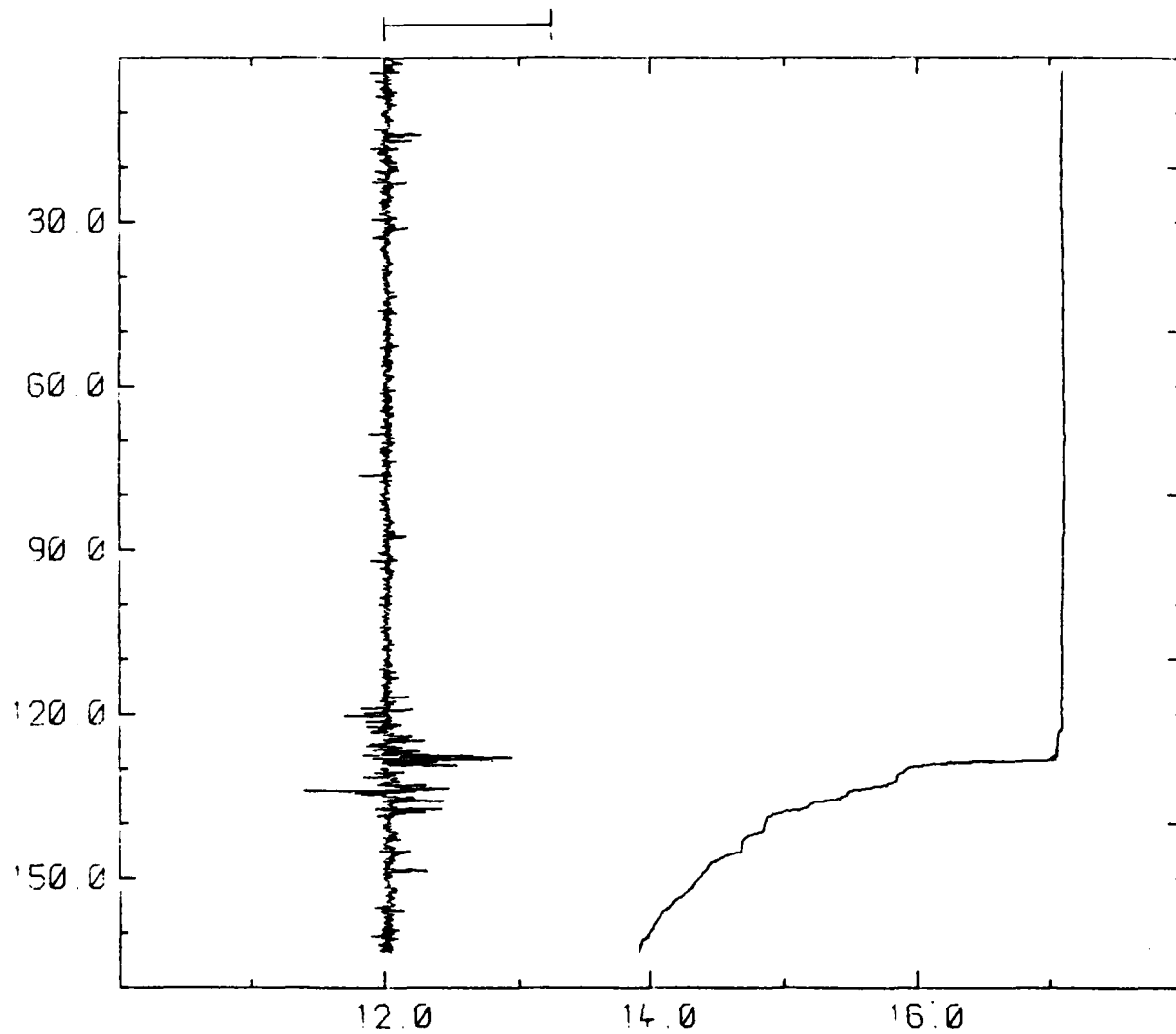


DATE 1/24/80  
TIME 2136 GMT



TAPE F3D FILE 2  
UNIT 2.79

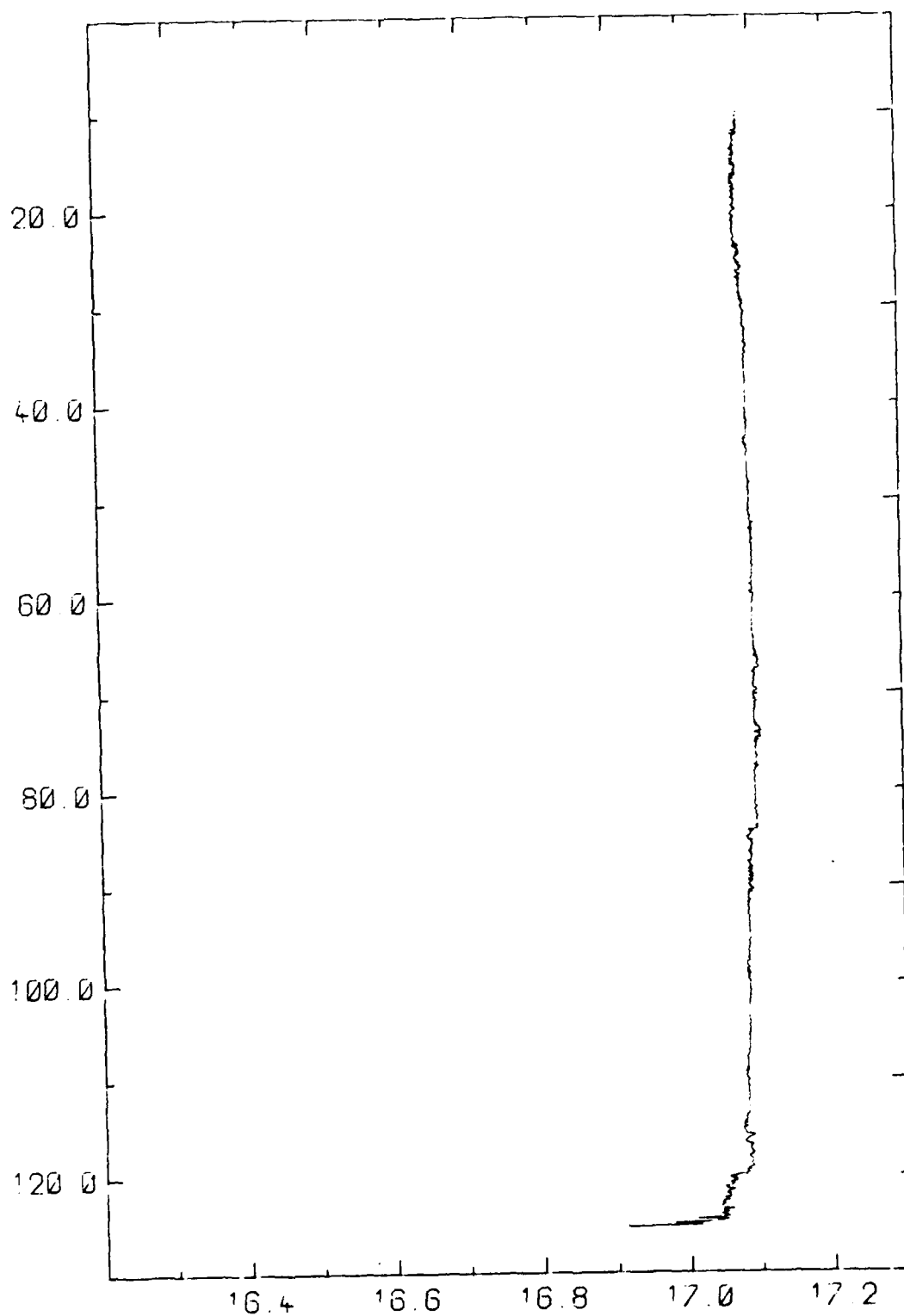
3.0 DEG/M



DATE 1/24/80  
TIME 2251 GMT

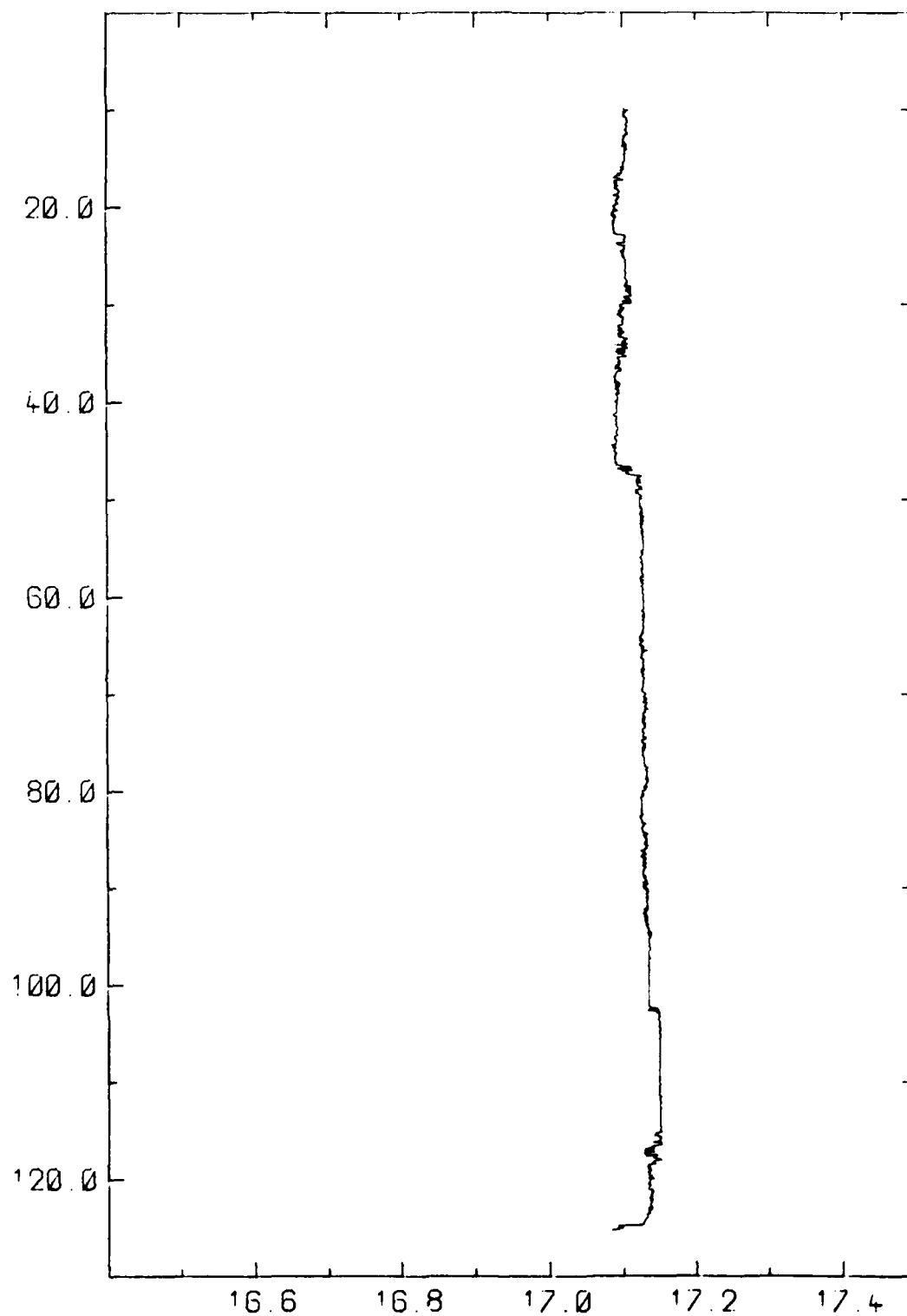
TAPE F30 FILE 2  
UNIT 2.79

59



DATE 1/24/80  
TIME 2251 GMT

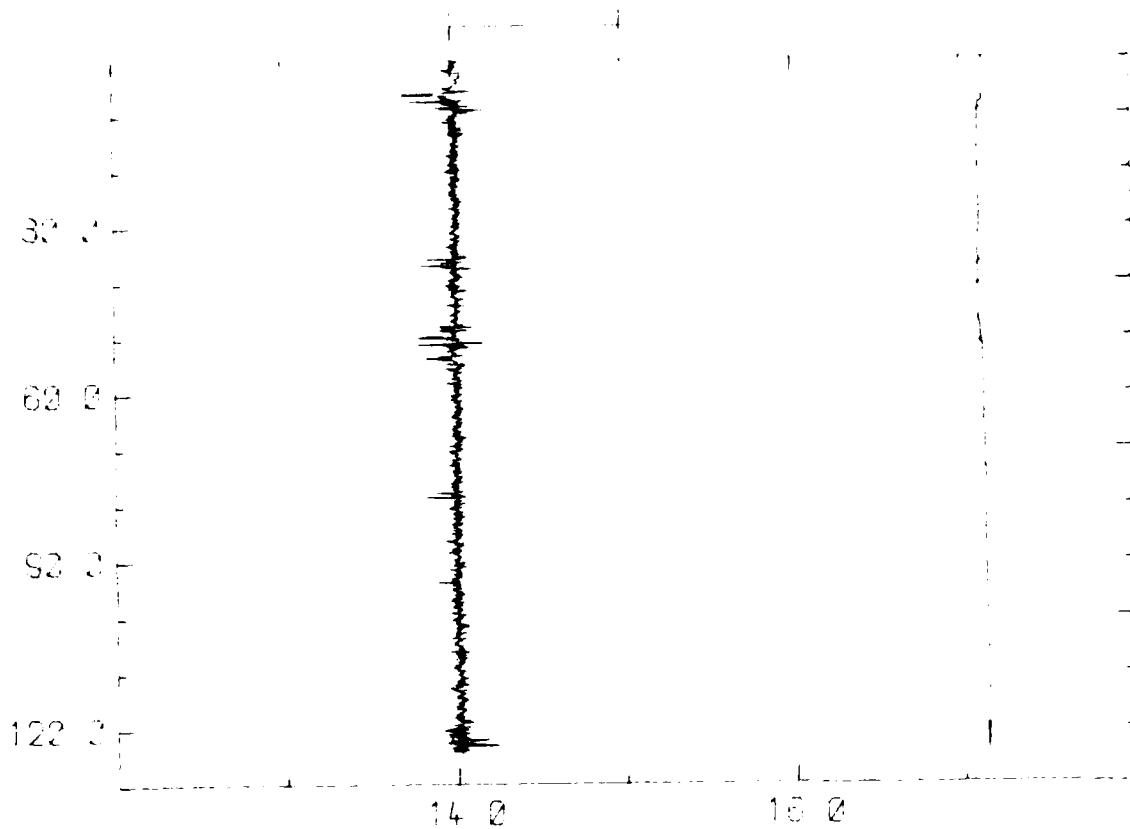
TAPE F3E FILE 1  
UNIT 2.79



DATE 1/24/80  
TIME 2317 GMT

DATE 1/24/80 FILE 2  
ON 1/2/80

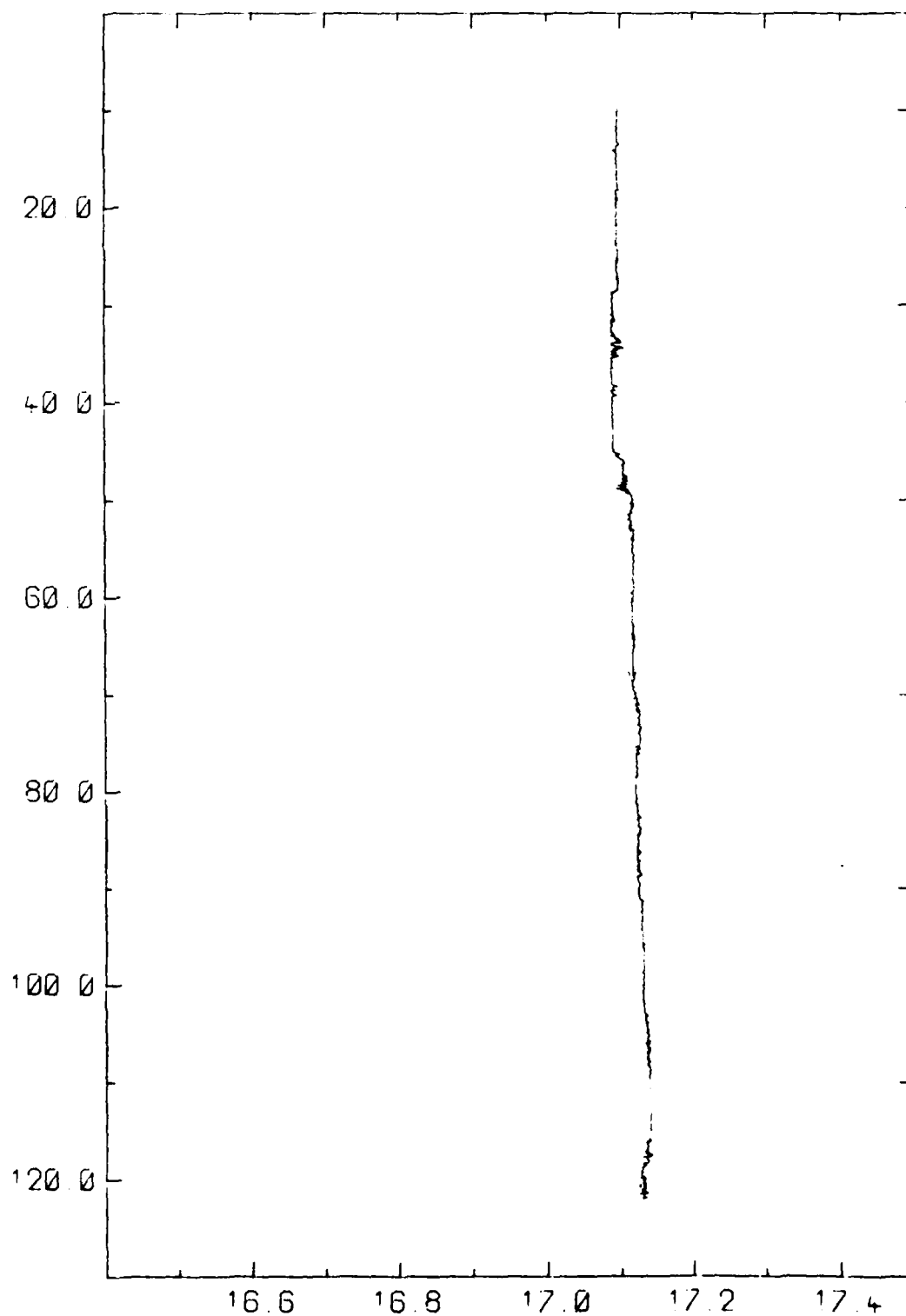
3.2 DES M



DATE 1/24/80  
TIME 2352 GMT

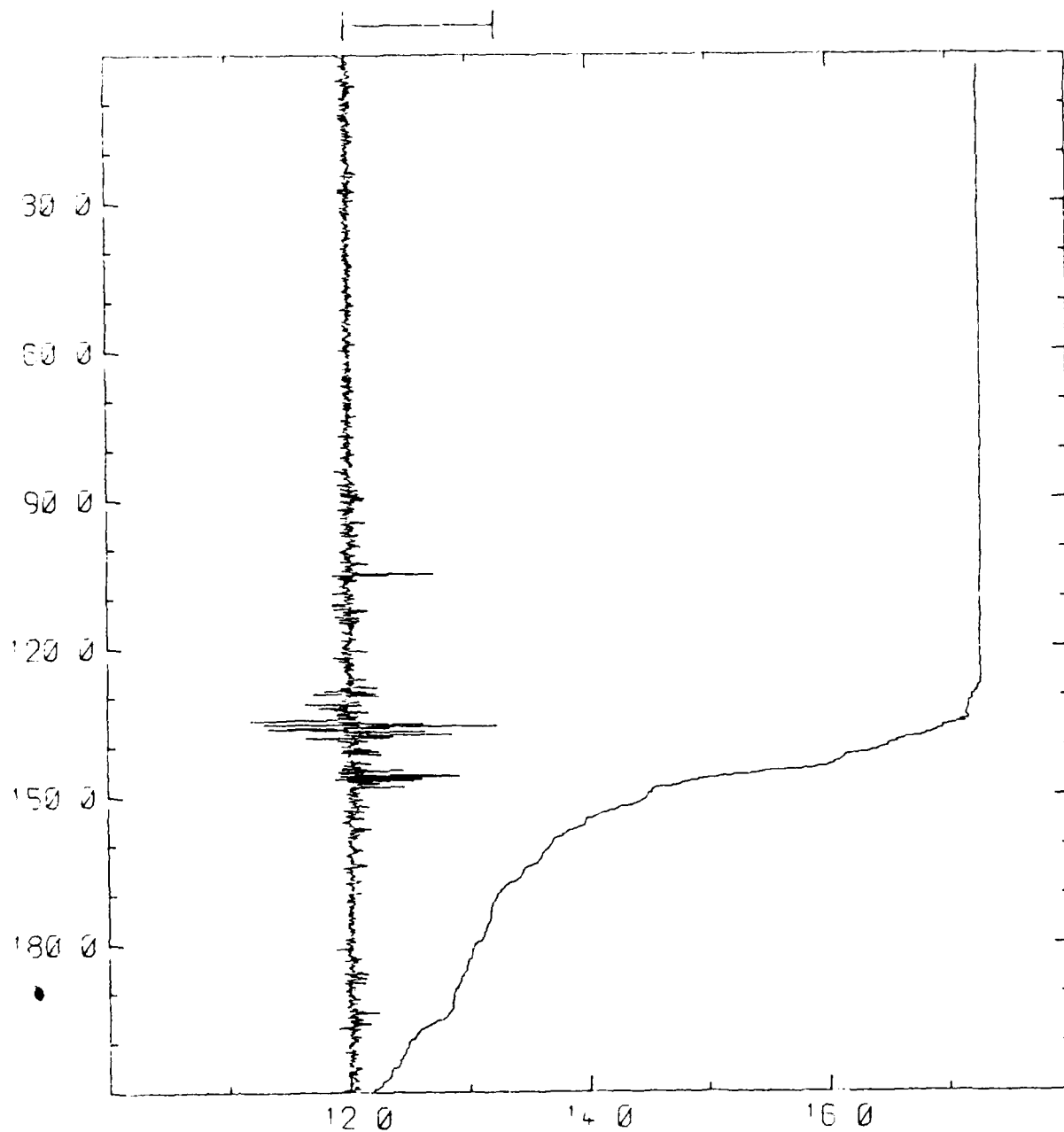
62

TYPE F3E FILE 2  
UNIT 2.79



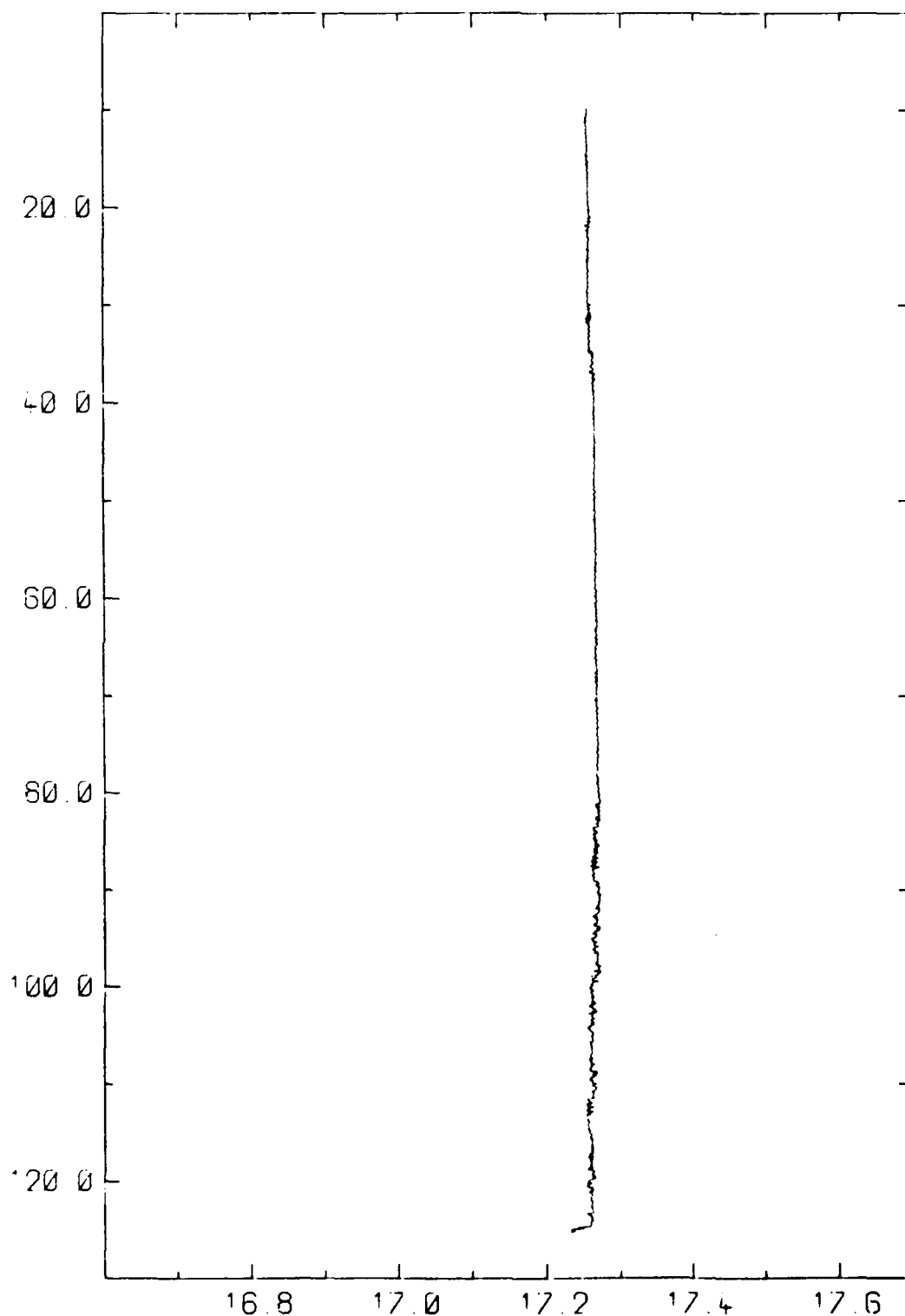
DATE 1/24/80  
TIME 2352 GMT

TAPE F5A FILE 1  
UNIT 2 79  
3 0 DEG/M



DATE 1/25/80  
TIME 1825 GMT

TAPE F5A FILE 1  
UNIT 2.79

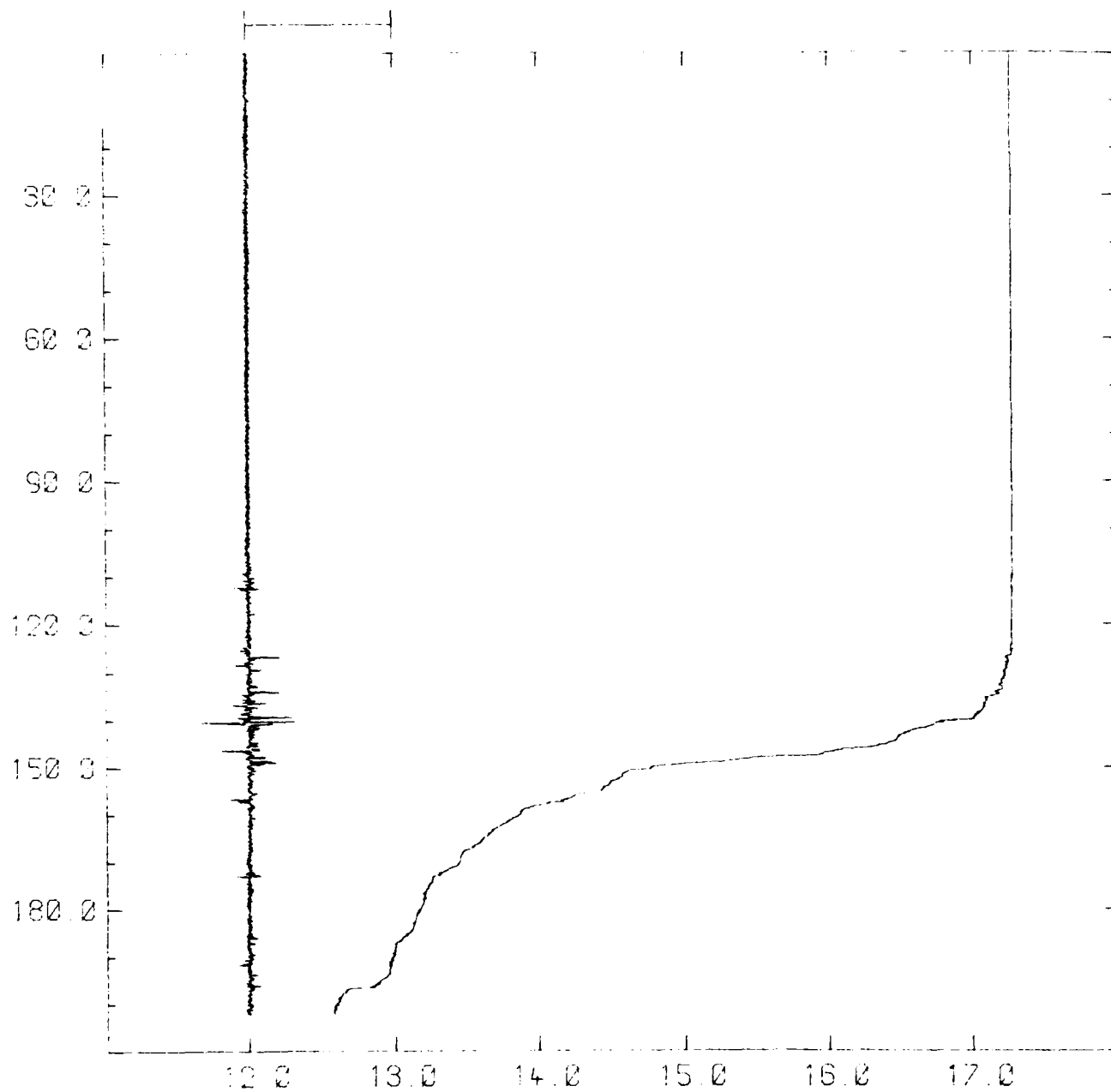


DATE 1/25/80  
TIME 1825 GMT

TAPE F5A FILE 2

UNIT 2.79

10.0 DEC/M



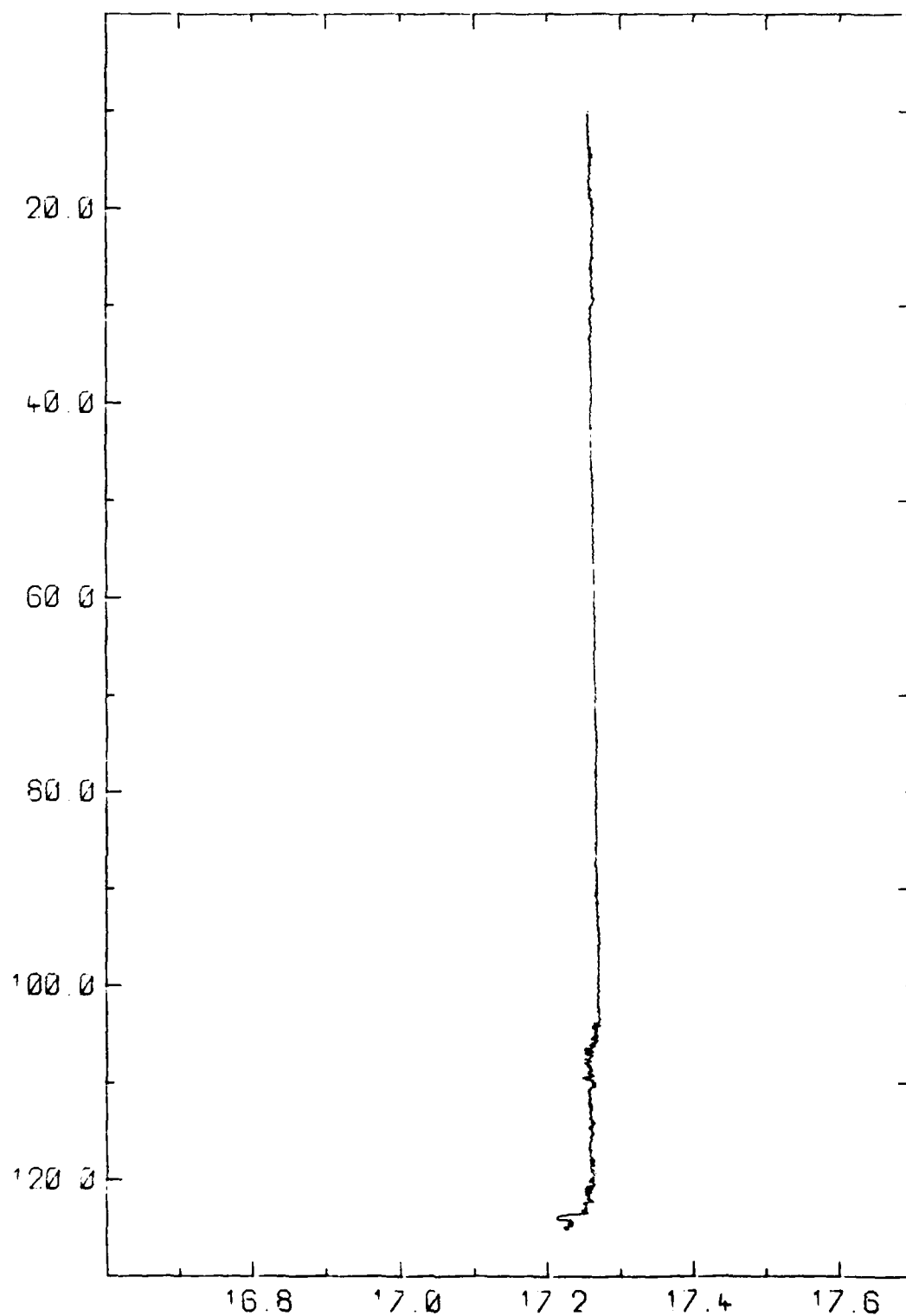
DATE 1/25/80

TIME 1935 GMT



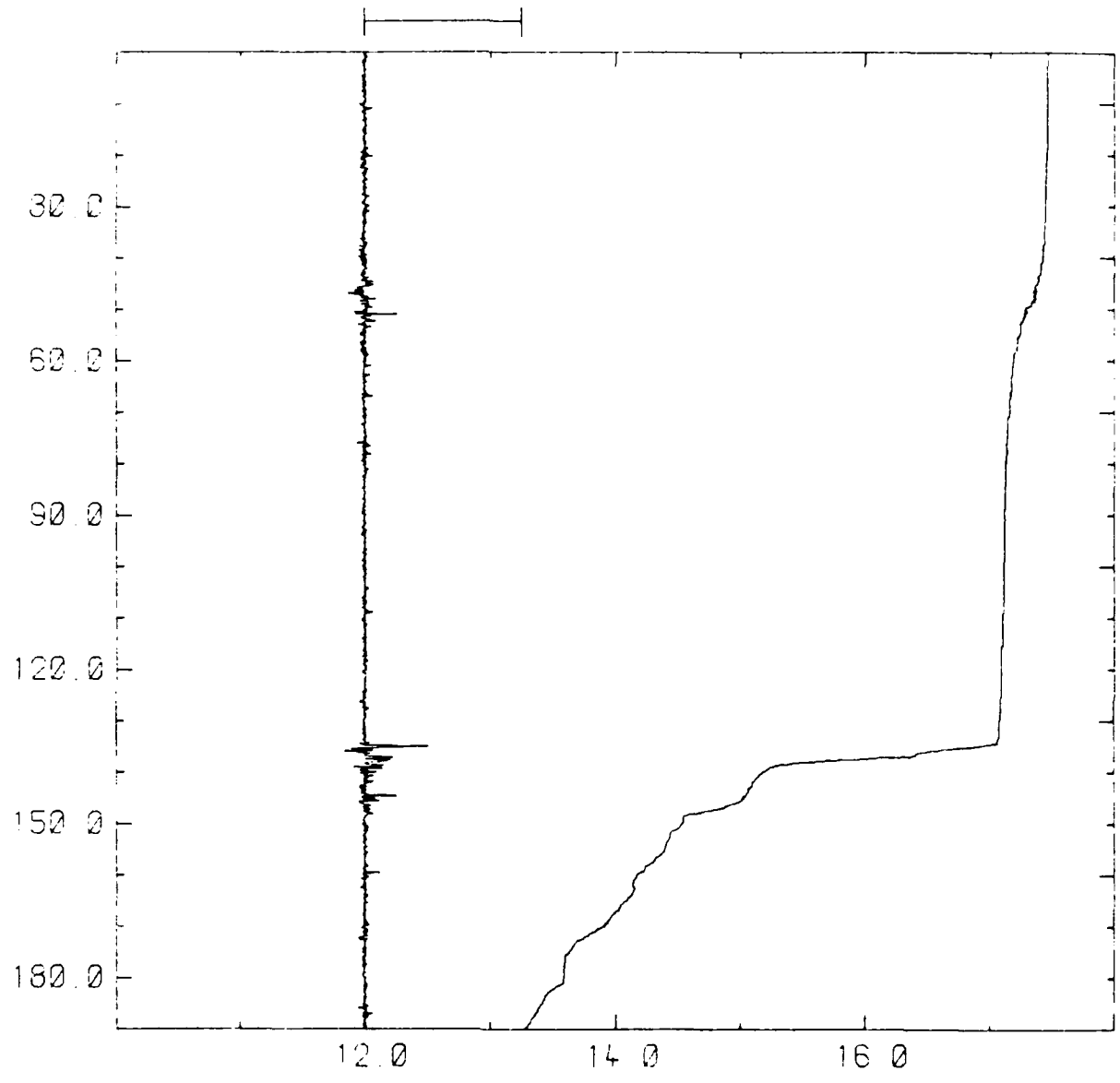
66

TAPE F5A FILE 2  
UNIT 2.79



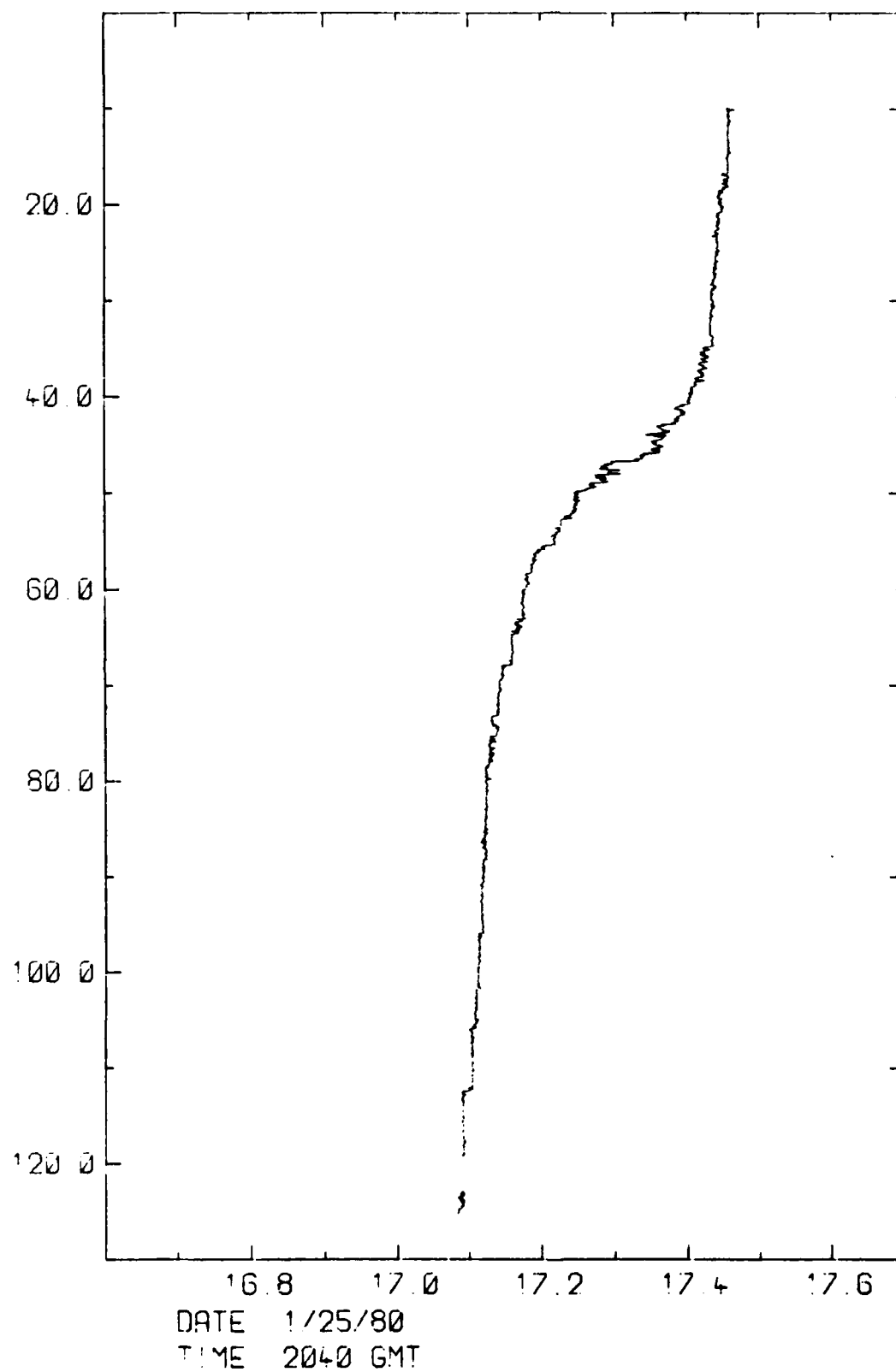
DATE 1/25/60  
TIME 1905 GMT

TAPE F5B FILE 1  
UNIT 2 79  
10.3 DEG/M



DATE 1/25/80  
TIME 2040 GMT

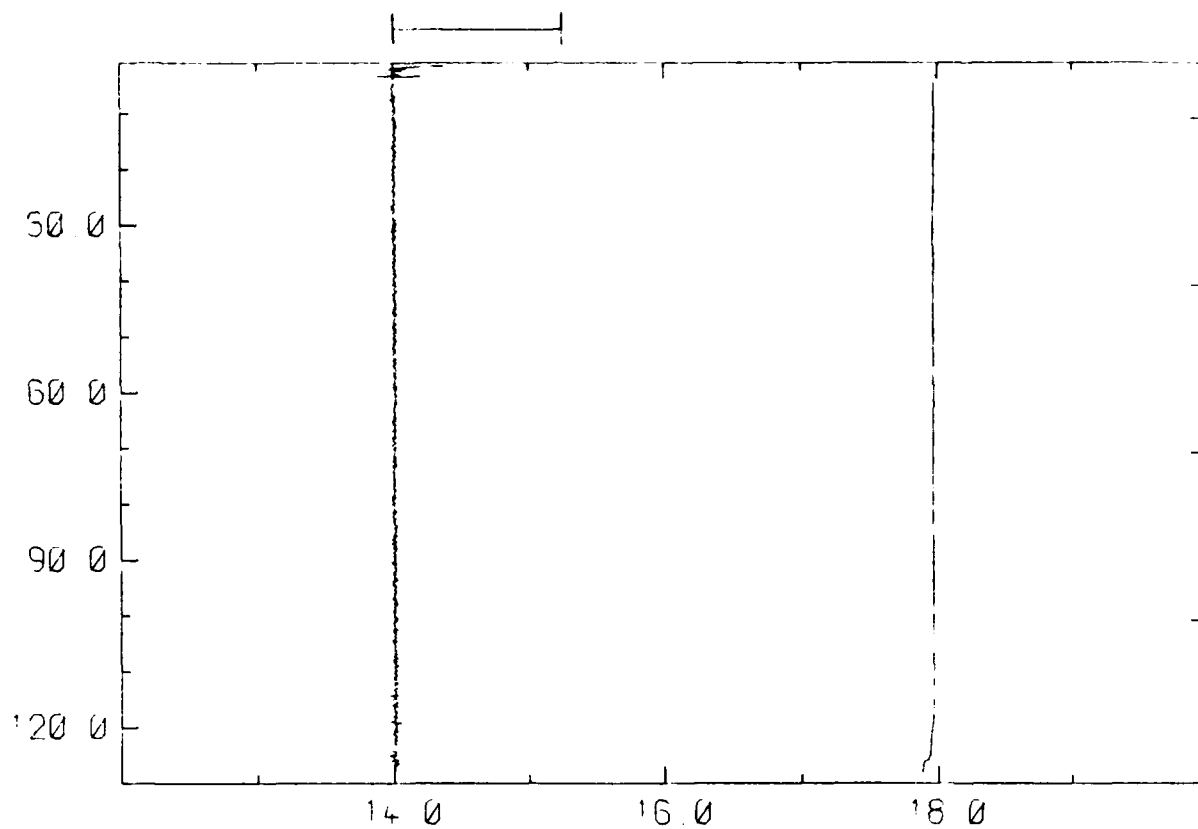
TAPE F5B FILE 1  
UNIT 2.79



TAPE F5B FILE 2  
UNIT 0.79

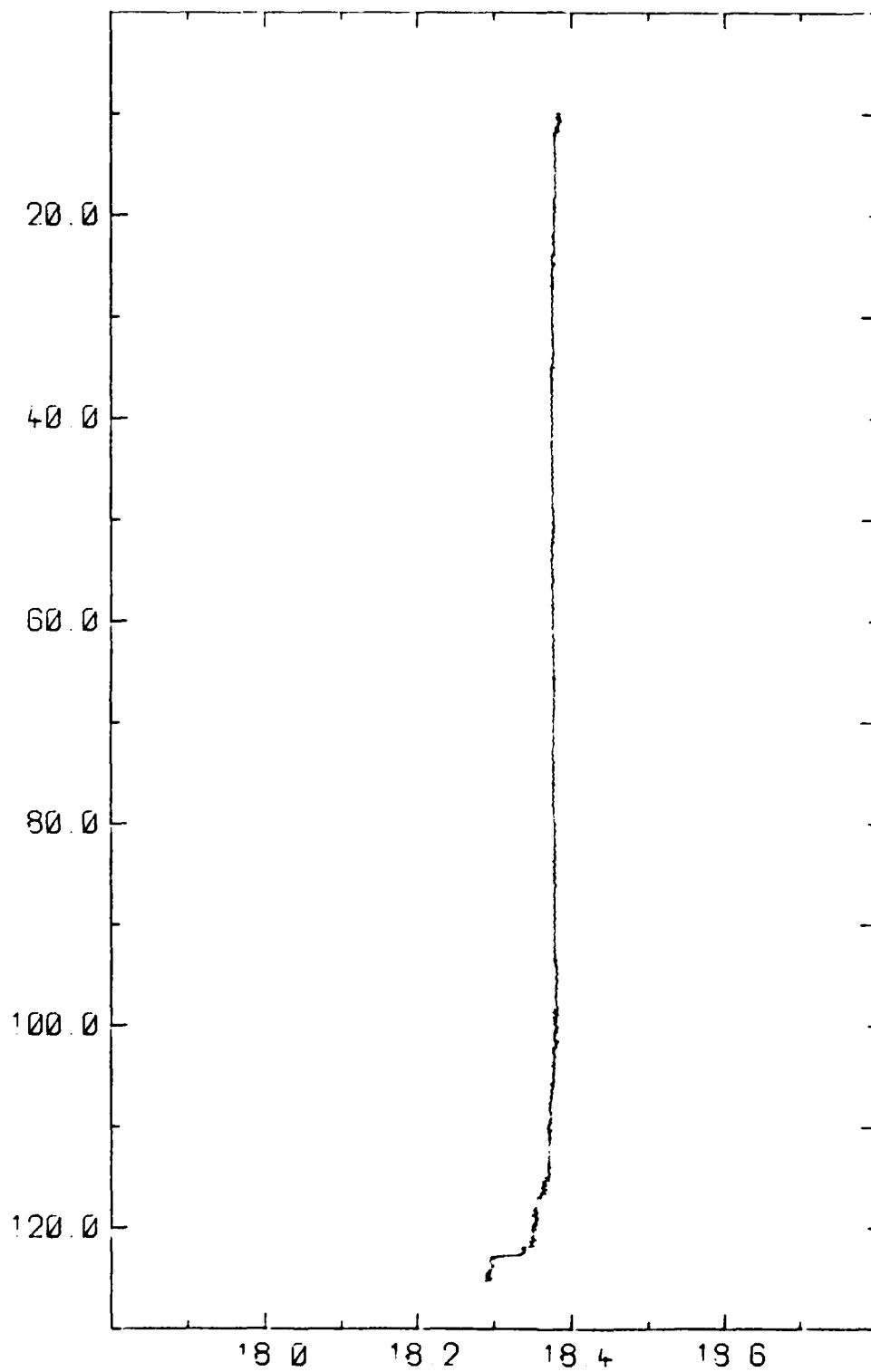
69

10 0 DEG/M



DATE 1/25/80  
TIME 2110 GMT

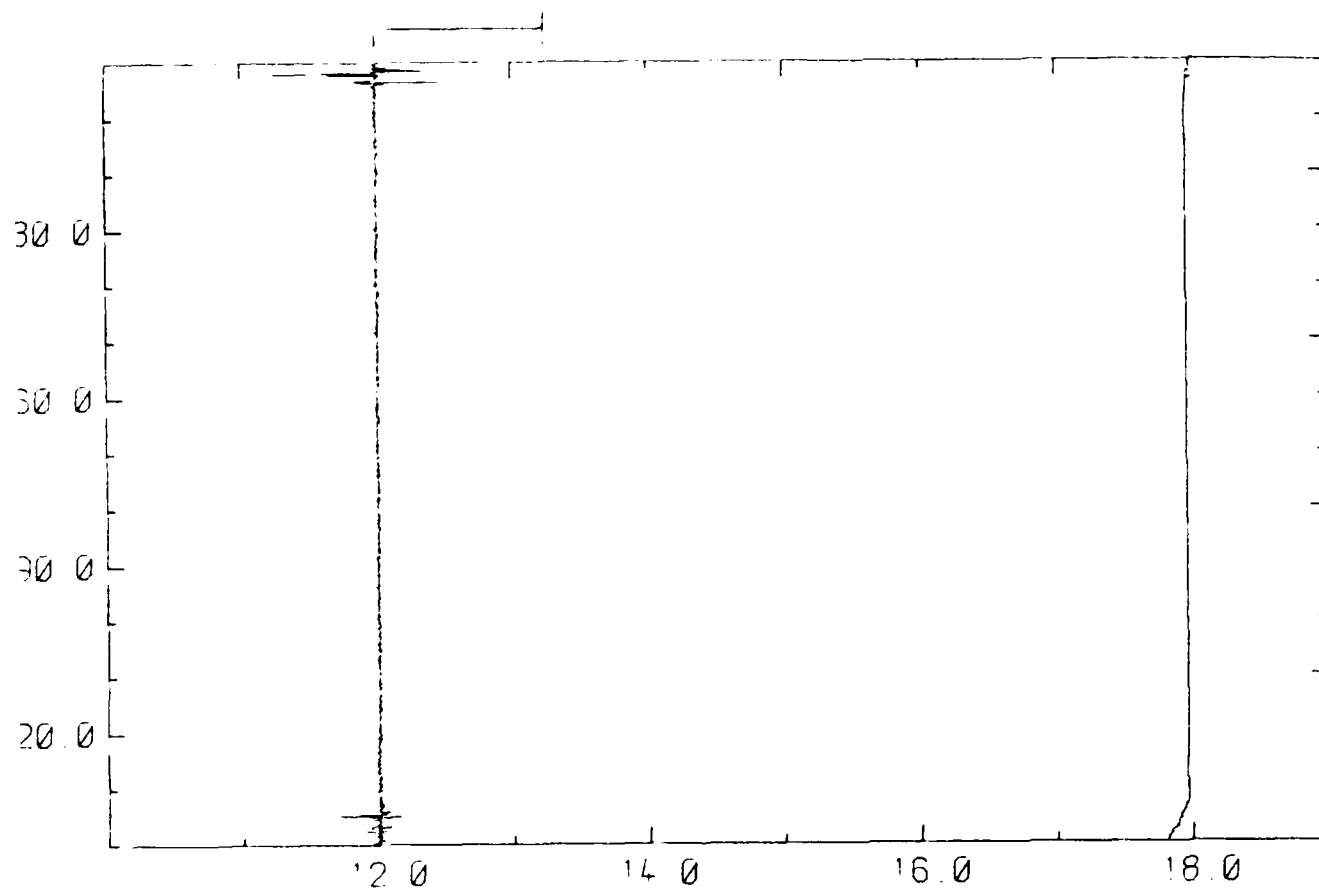
TAPE F5B    FILE 2  
UNIT 2 79



DATE 1/25/80  
TIME 2110 GMT

TAPE F50 FILE 1  
UNIT 2 79

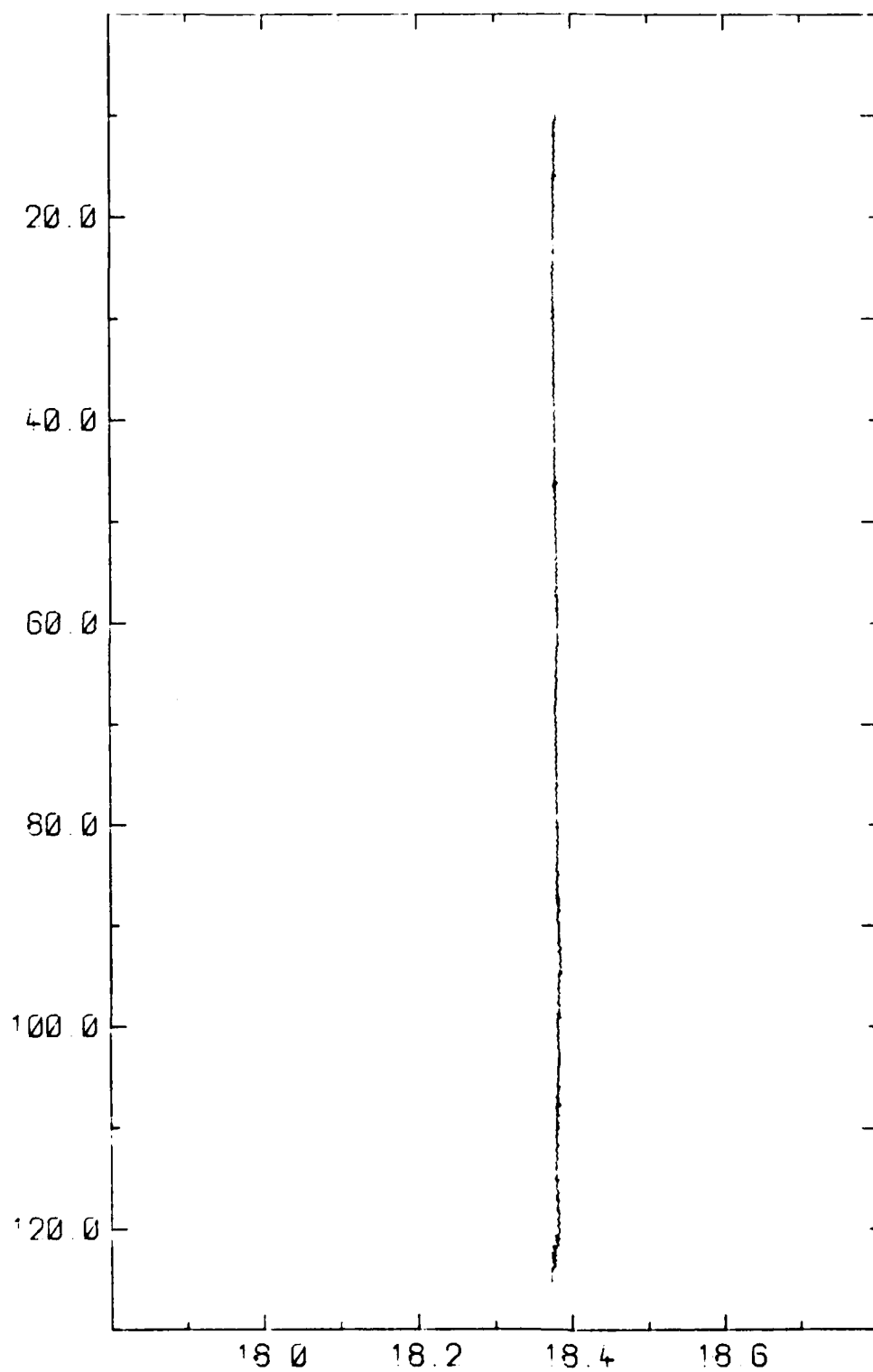
0 0 DEG/M



DATE 1/25/80  
TIME 2247 GMT

72

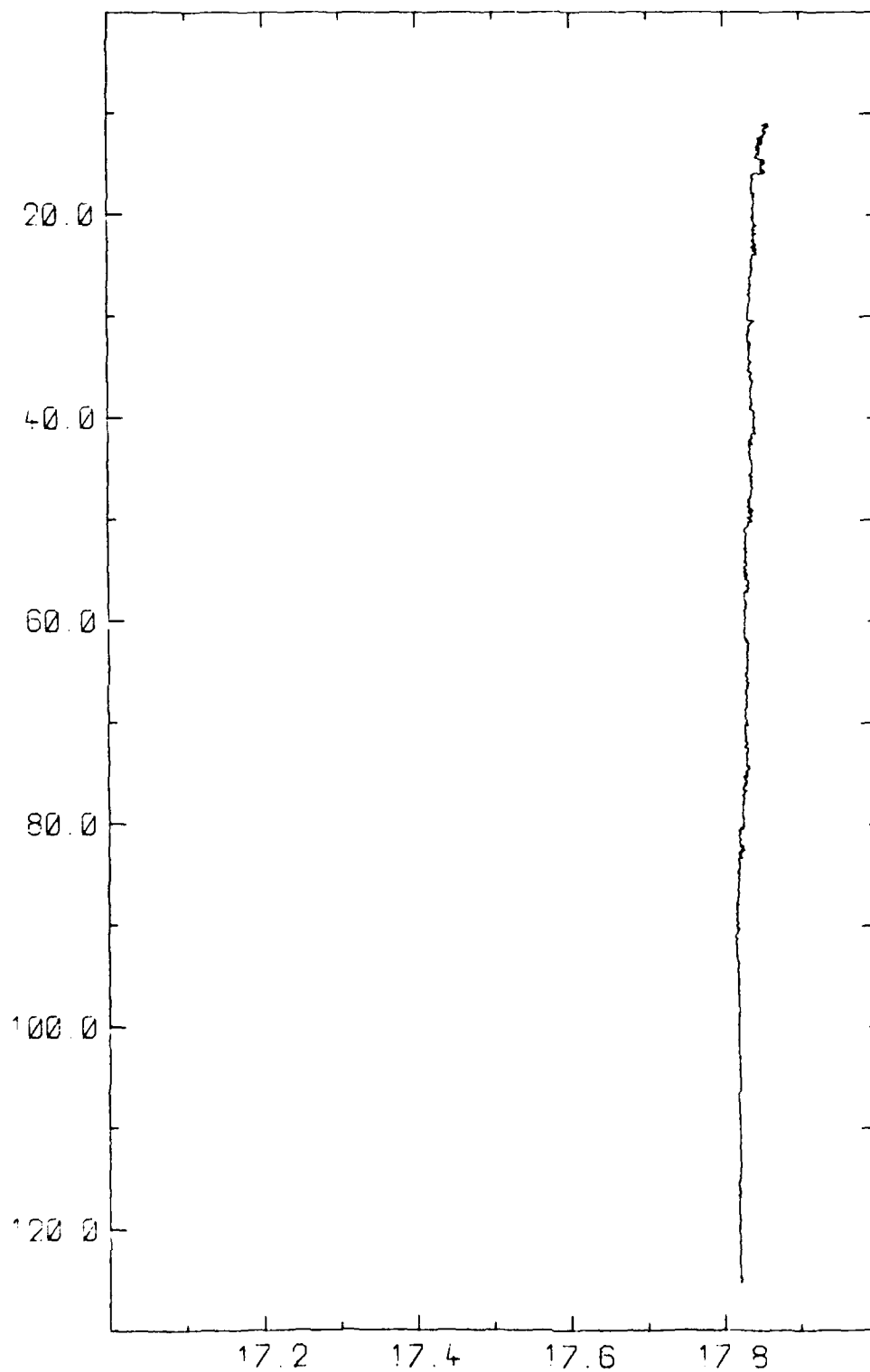
TAPE F50 FILE 1  
UNIT 2.79



DATE 1/25/80  
TIME 2247 GMT

TAPE F5C    FILE 3  
UNIT 2.79

73

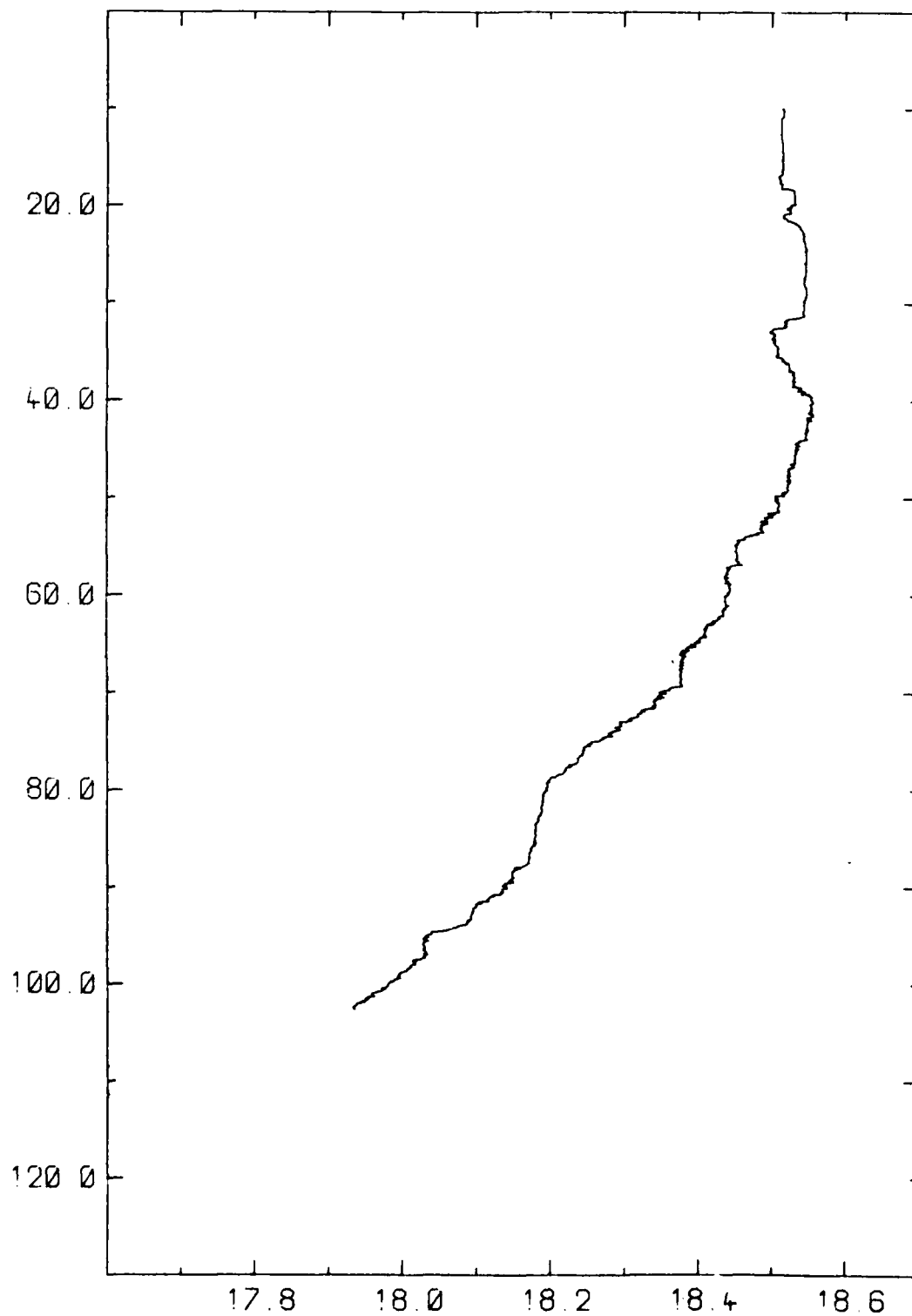


DATE 1/26/80  
TIME 0054 GMT



74

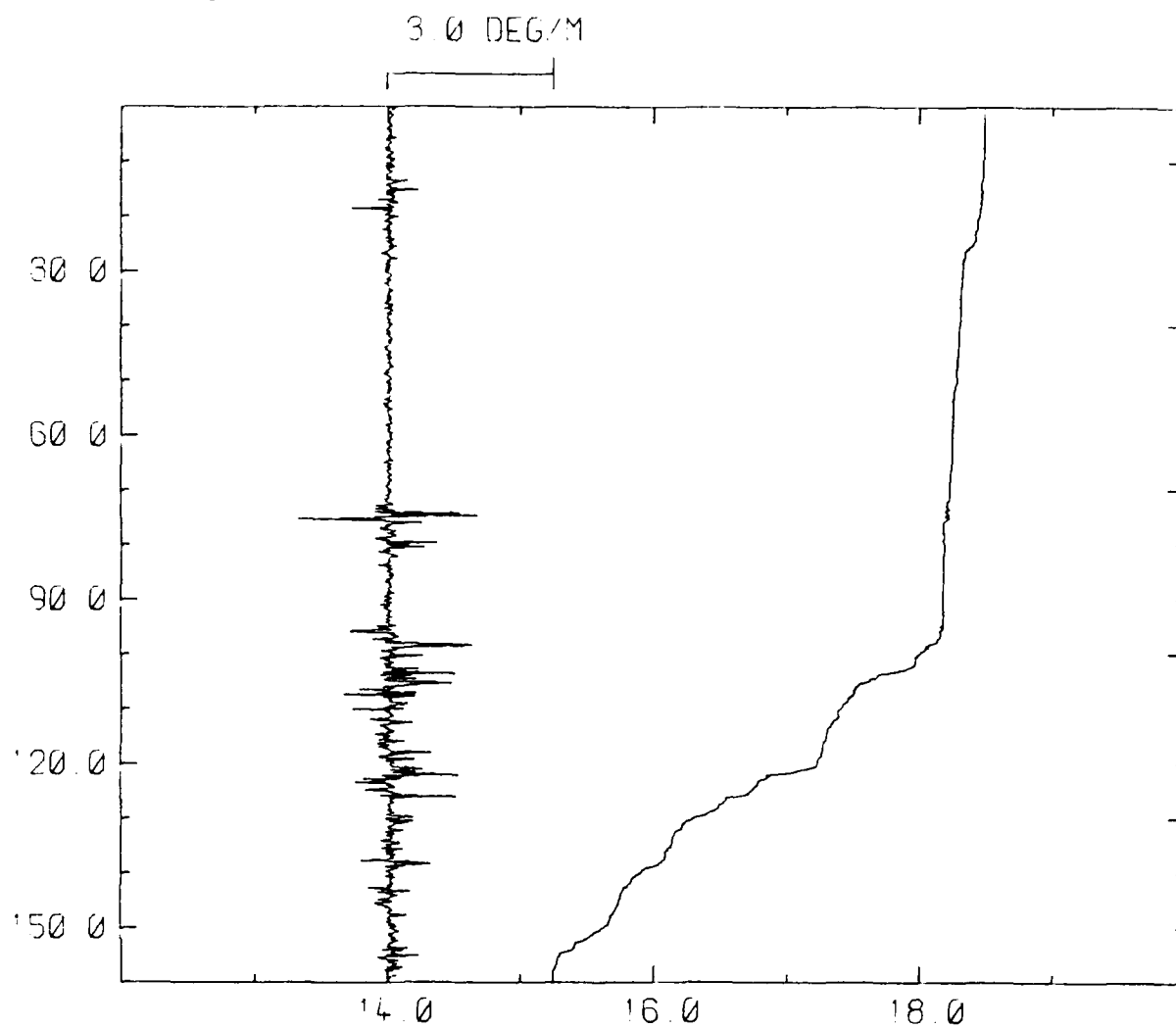
TAPE F5E FILE 2  
UNIT 2.79



DATE 1/26/80  
TIME 0551 GMT

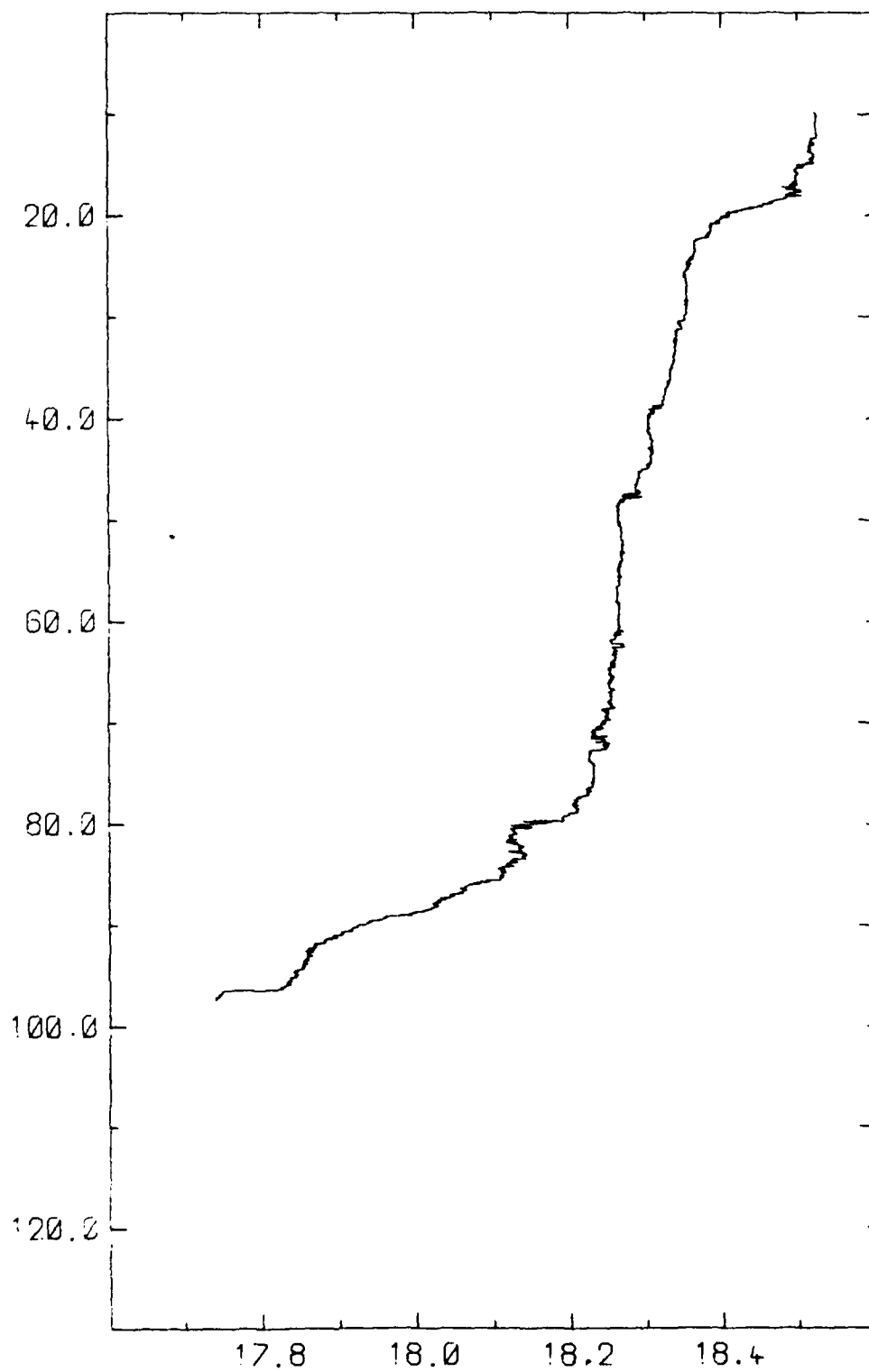
TAPE FOR FILE 4  
UNIT 2.79

75



DATE 1/26/80  
TIME 2035 GMT

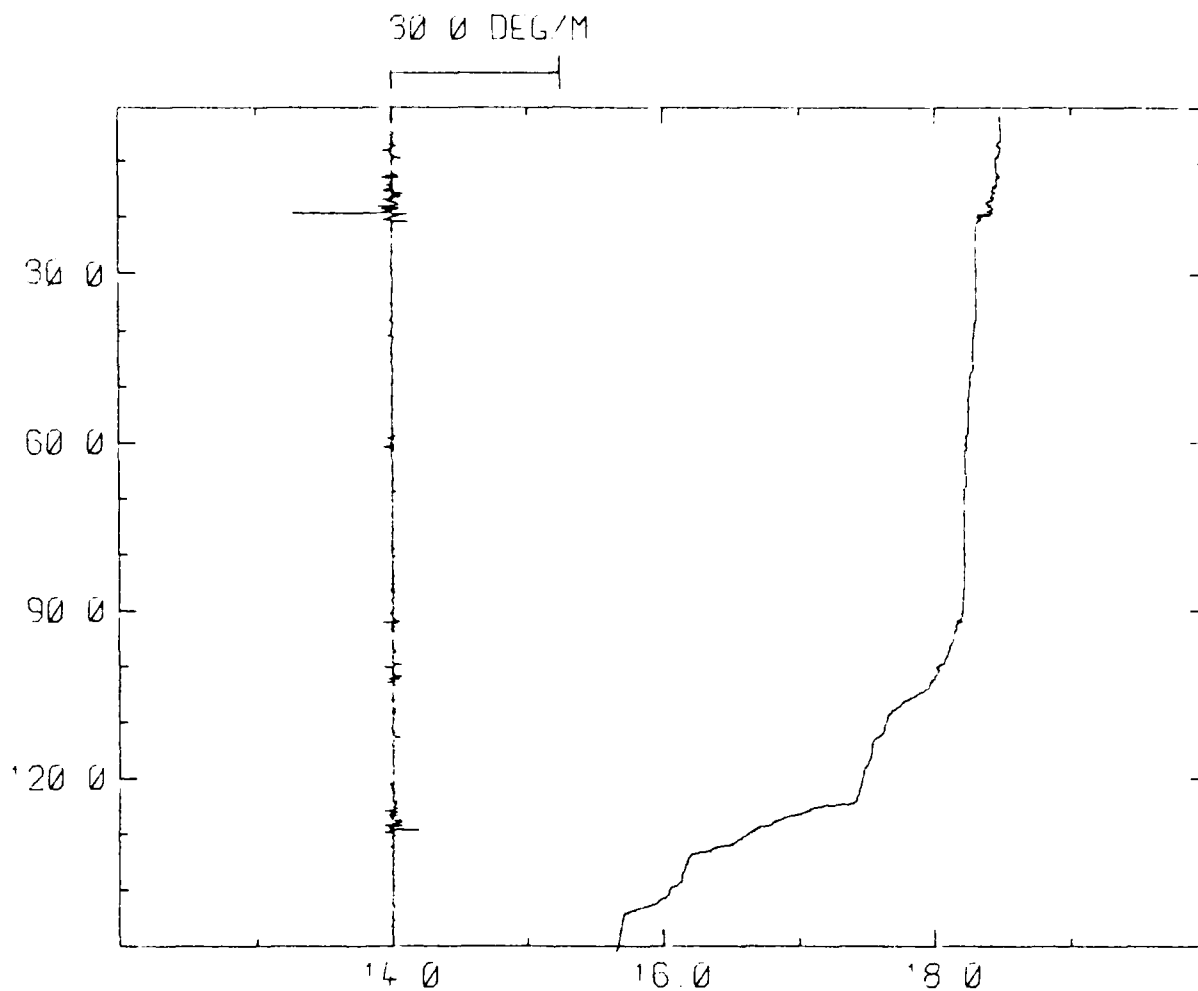
TAPE F6B    FILE 1  
UNIT 2.79



DATE 1/26/80  
TIME 2102 GMT

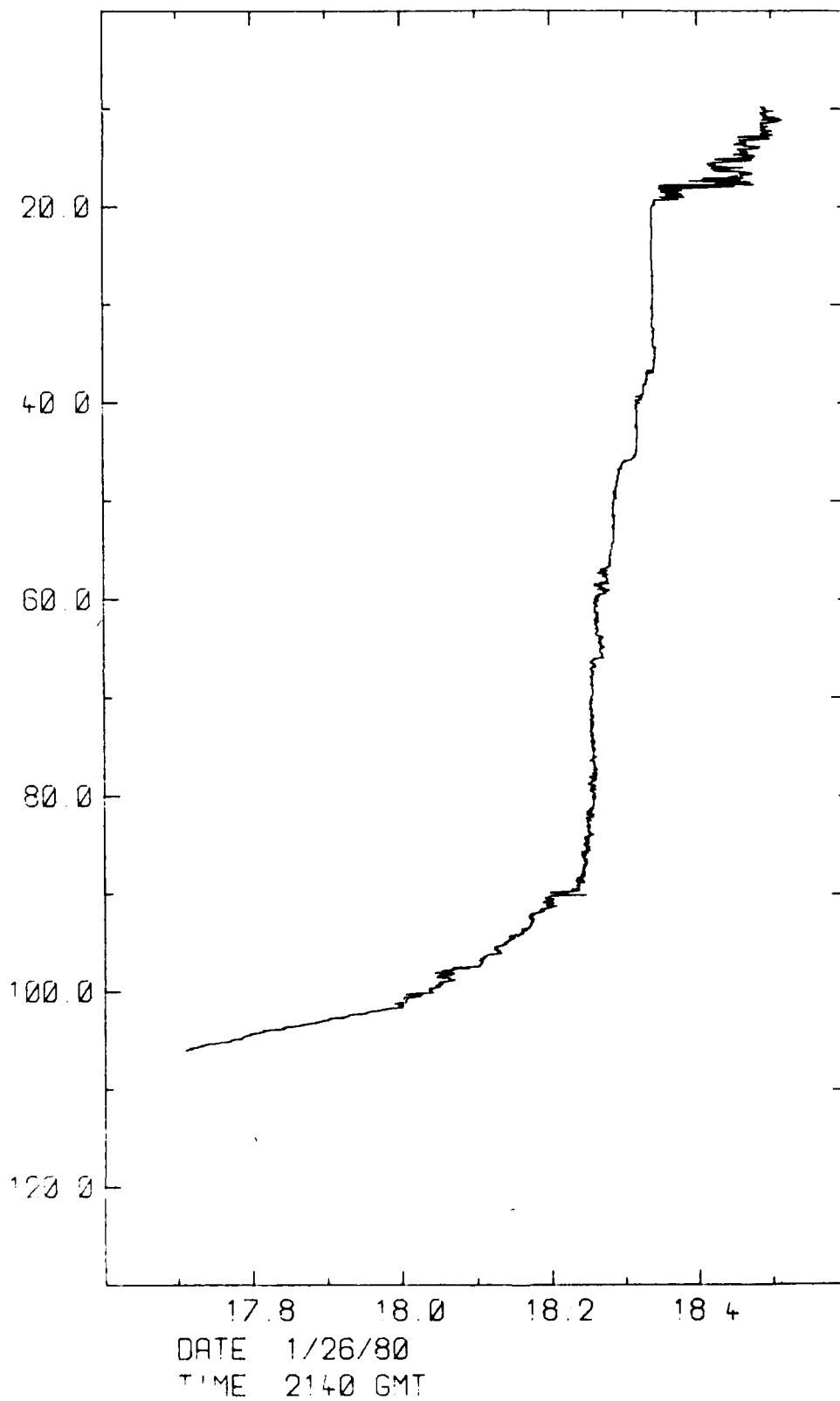
TAPE F60 FILE 1  
UNIT 2 79

77



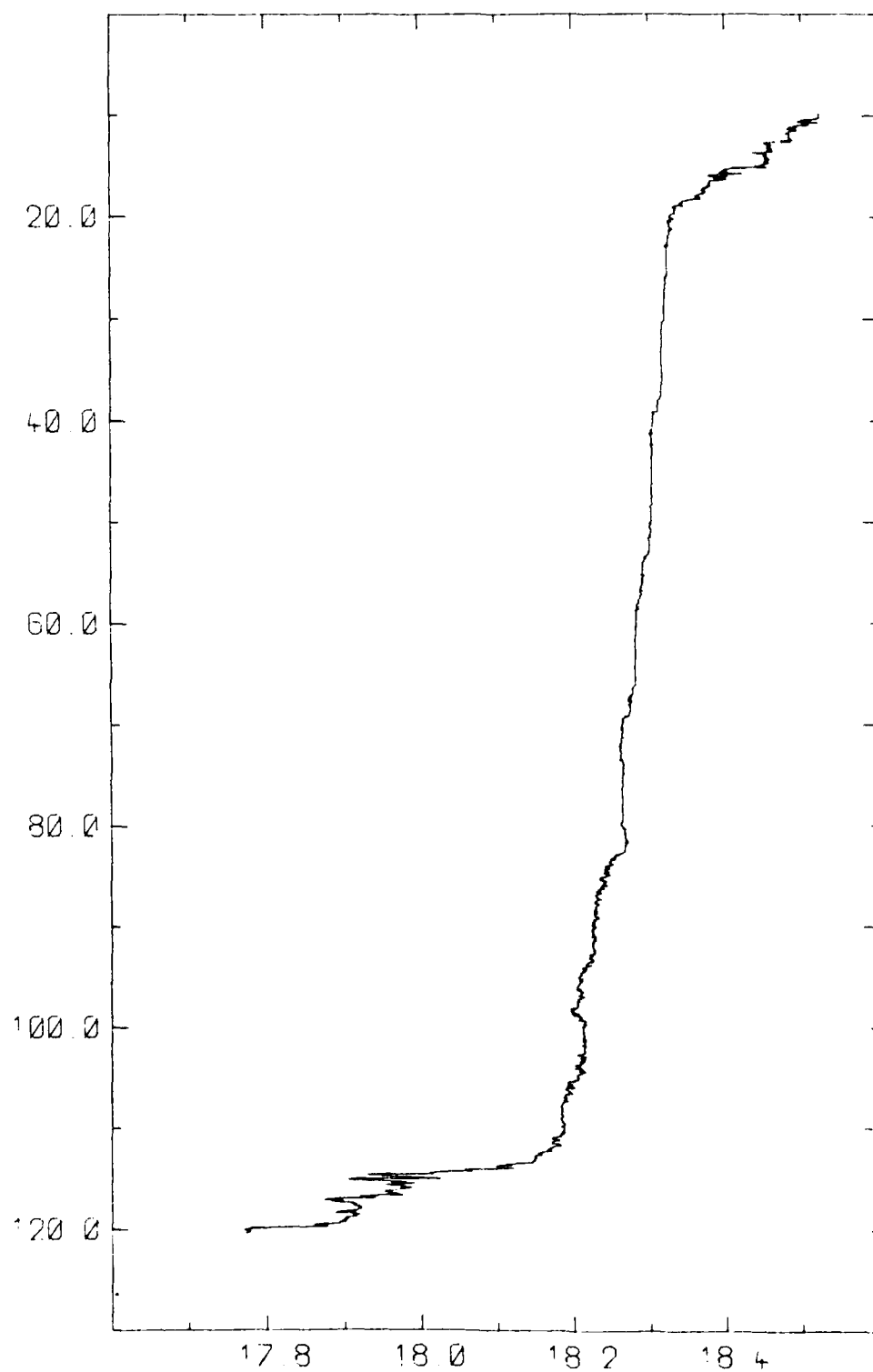
DATE 1/26/80  
TIME 2140 GMT

TAPE F6C    FILE 1  
UNIT 2.79



TAPE F6C FILE 3  
UNIT 2.79

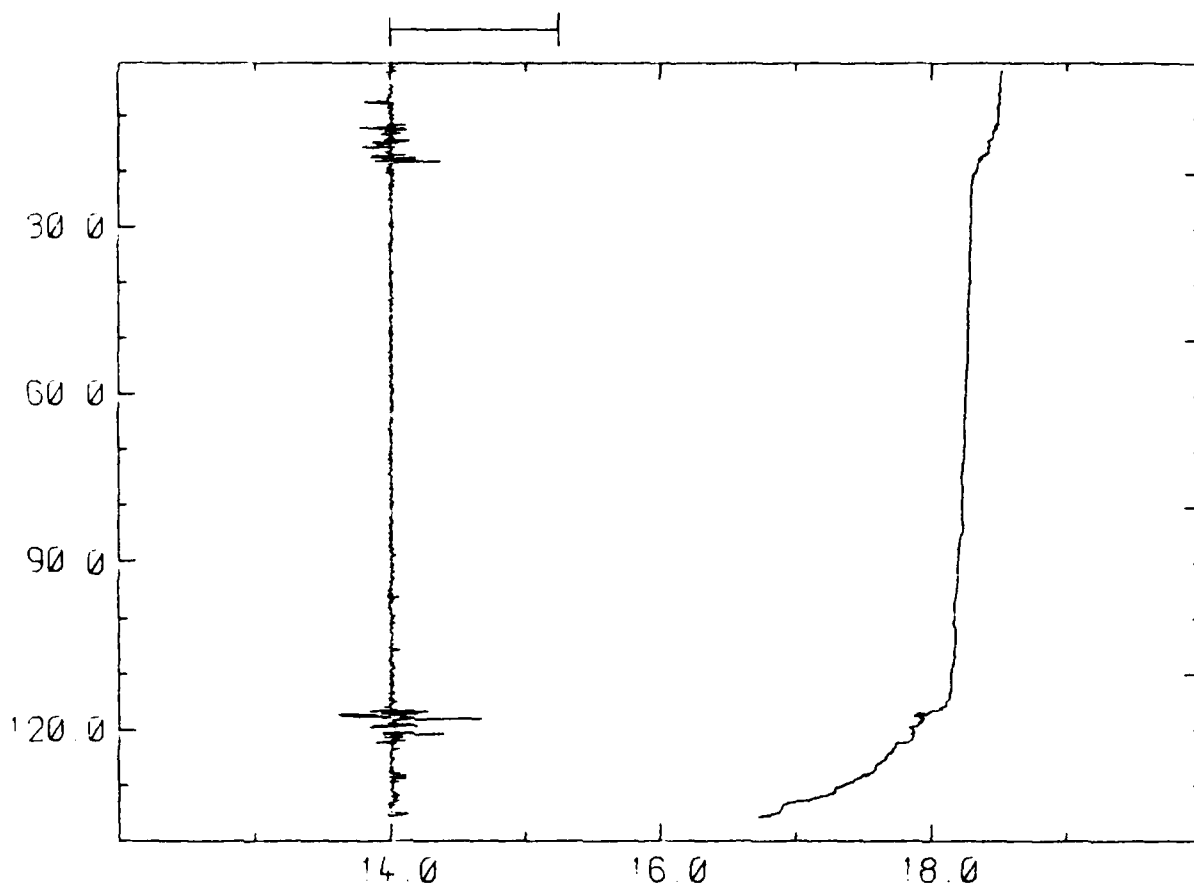
79



DATE 1/26/80  
TIME 2303 GMT

TAPE F6C FILE 3  
UNIT 2.79

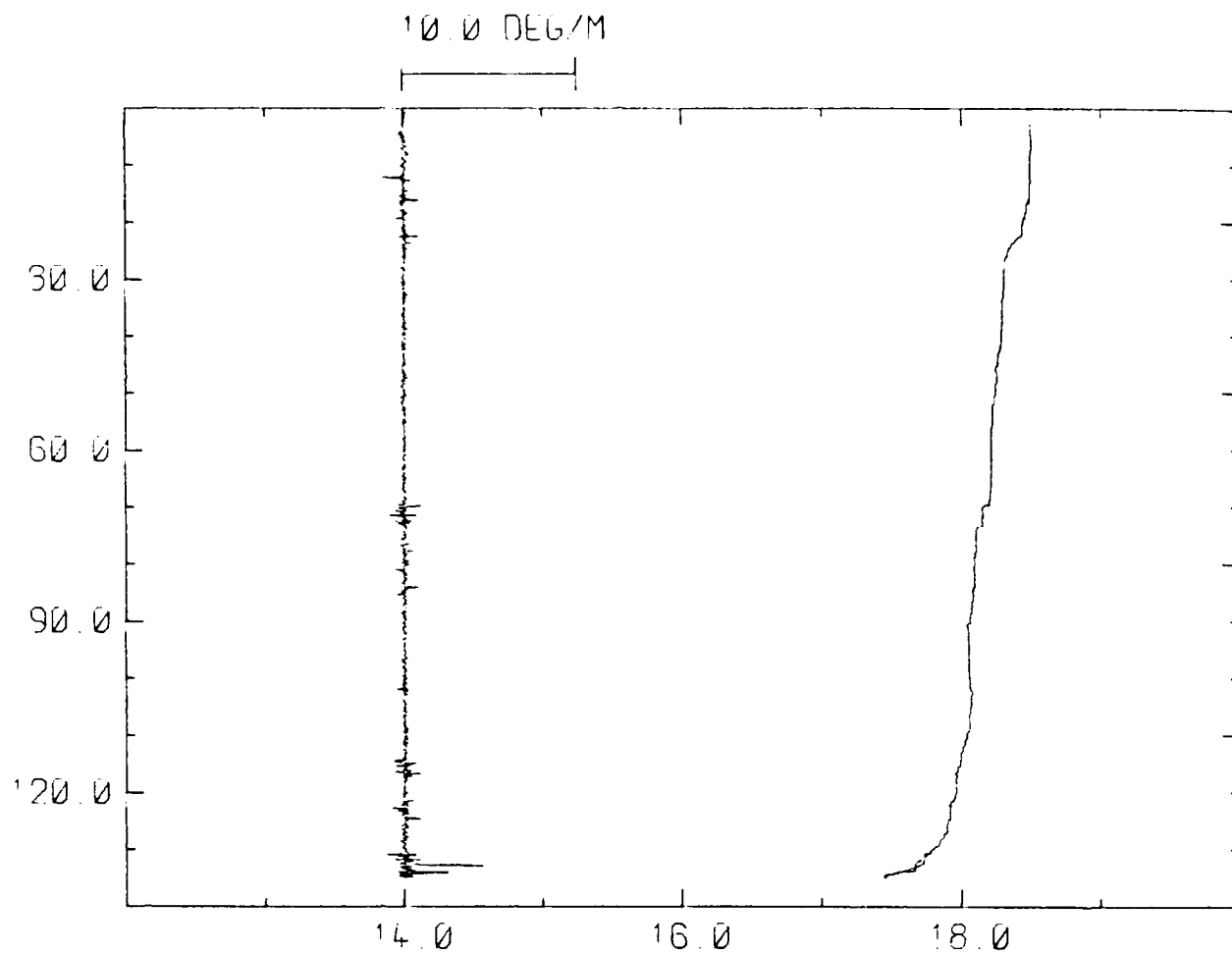
10.0 DEG/M



DATE 1/26/80  
TIME 2303 GMT

TAPE F60 FILE 1  
UNIT 2.79

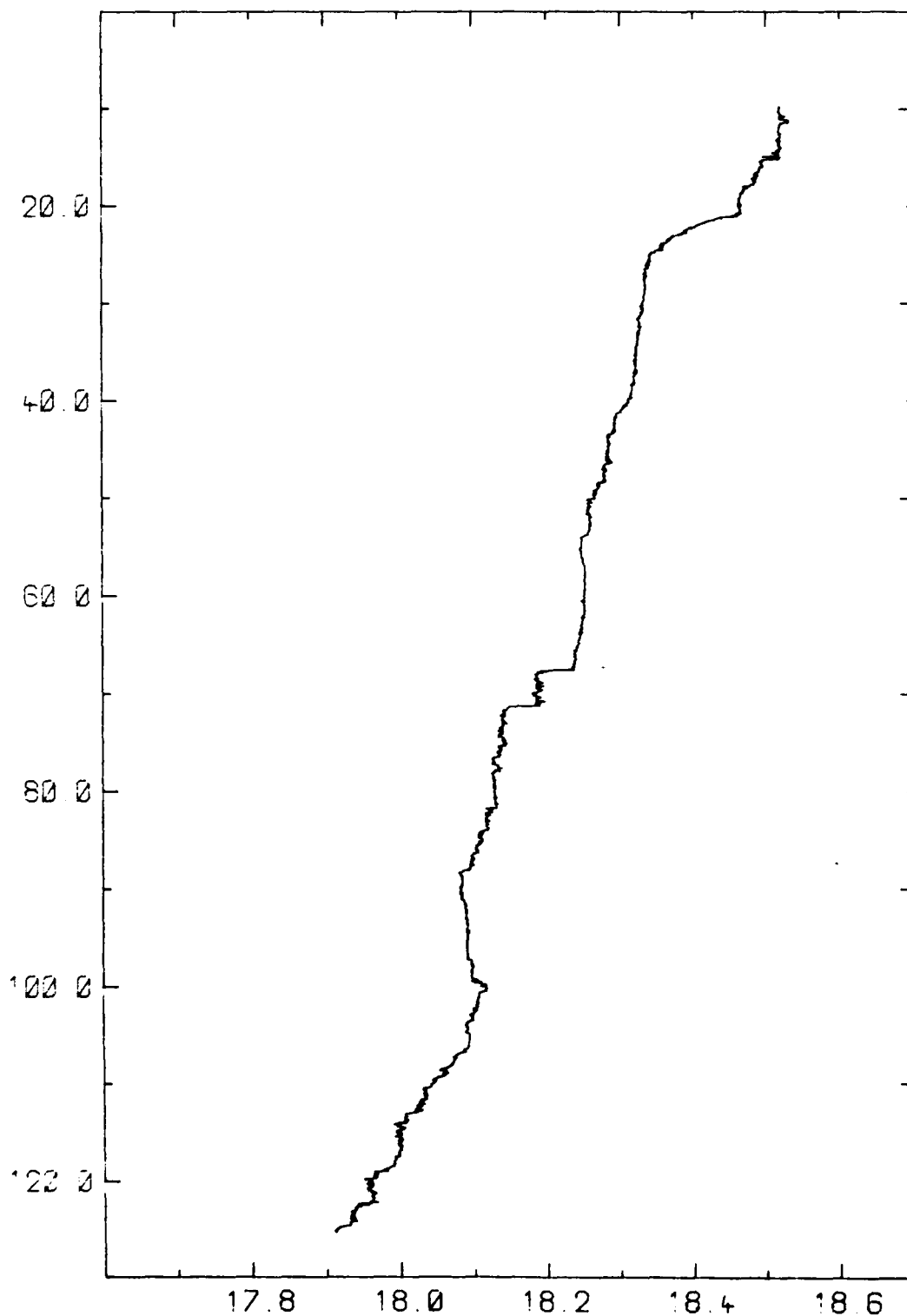
81



DATE 1/26/80  
TIME 2334 GMT



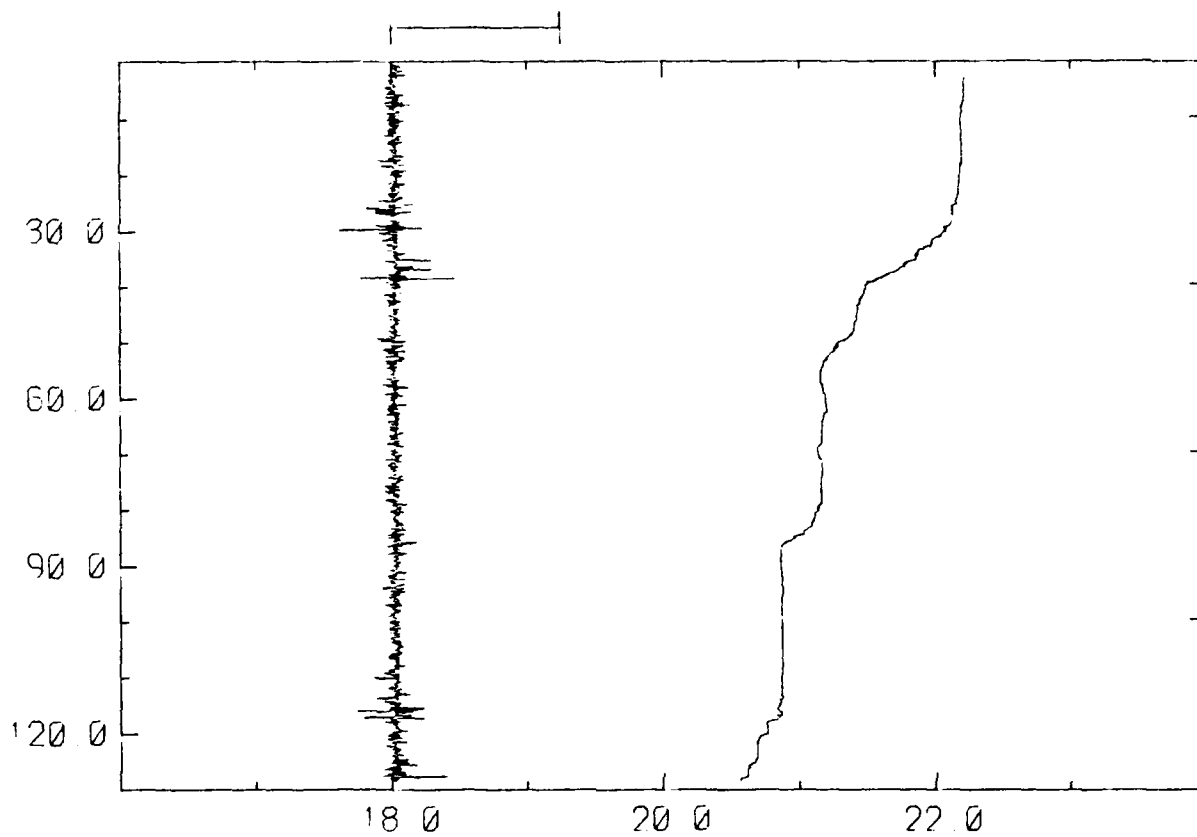
TAPE F6D FILE 1  
UNIT 2.79



DATE 1/26/80  
TIME 2334 GMT

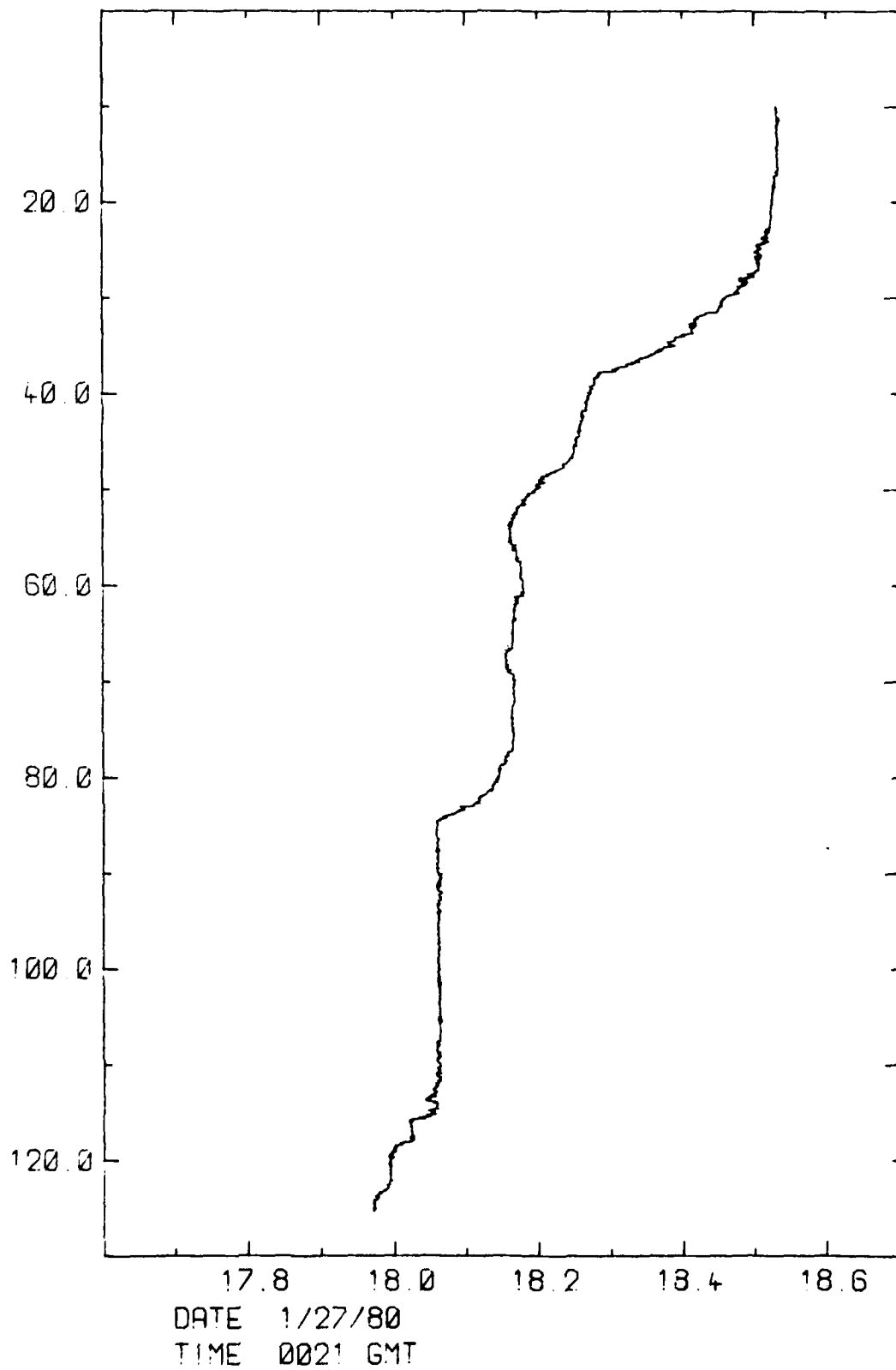
TAPE F60 FILE 2  
UNIT 2 79

3 0 DEG/M



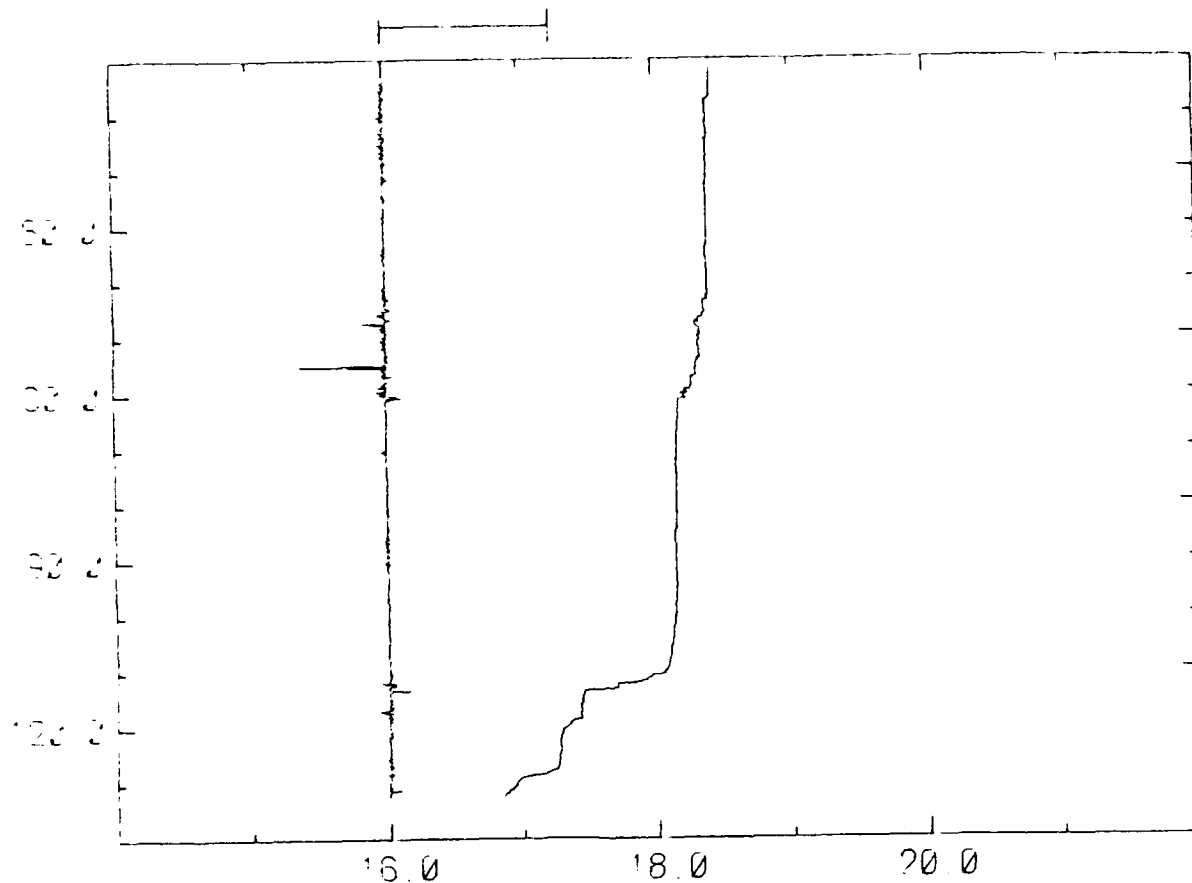
DATE 1/27/80  
TIME 0021 GMT

TAPE F60 FILE 2  
UNIT 2.79



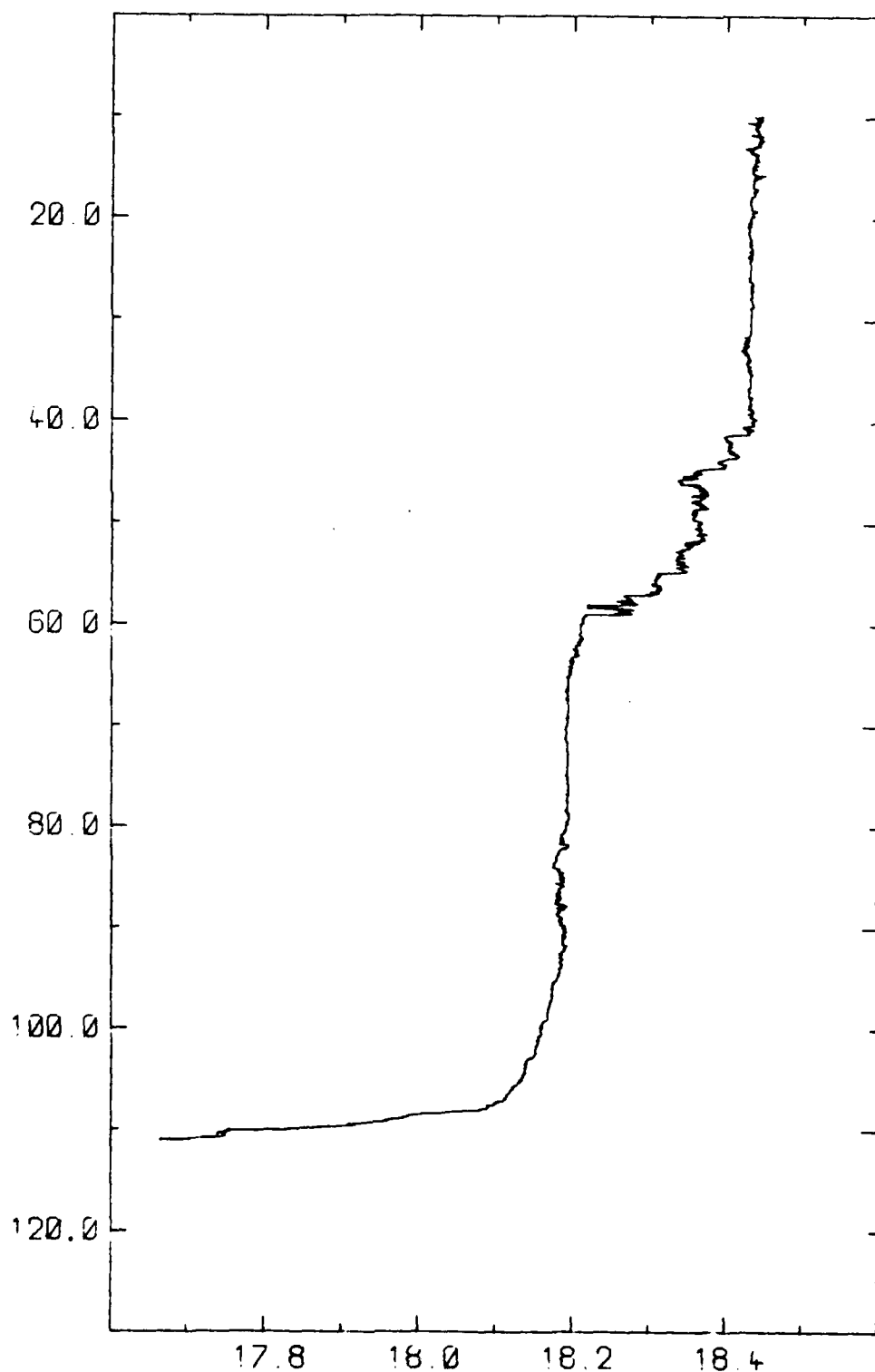
TAPE F2A FILE 1  
UNIT 2 79

30.0 DEG/M



DATE 1/27/80  
TIME 0212 GMT

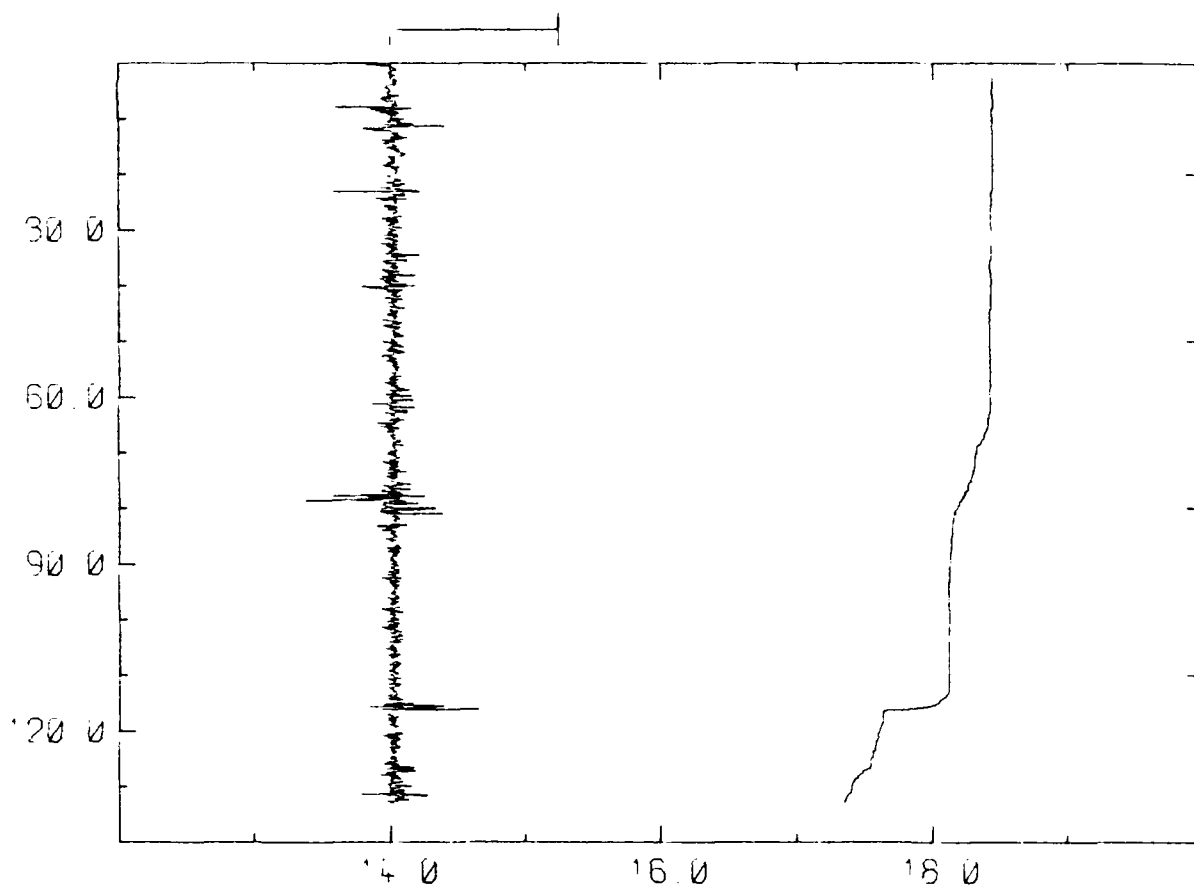
TAPE F7A FILE 1  
UNIT 2.79



DATE 1/27/80  
TIME 0212 GMT

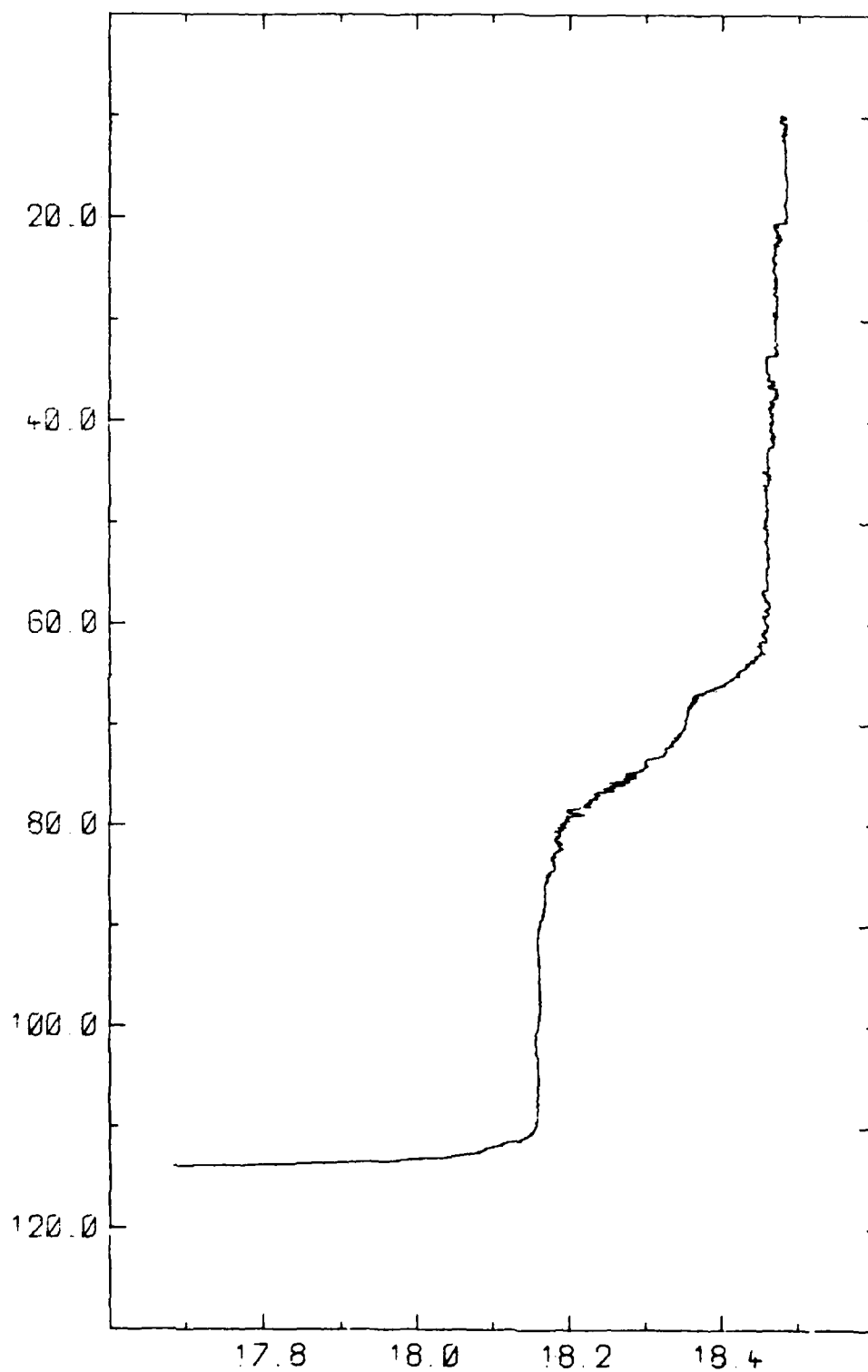
TAPE F7A FILE 2  
UNIT 2 79

3 0 DEG/M



DATE 1/27/80  
TIME 0239 GMT

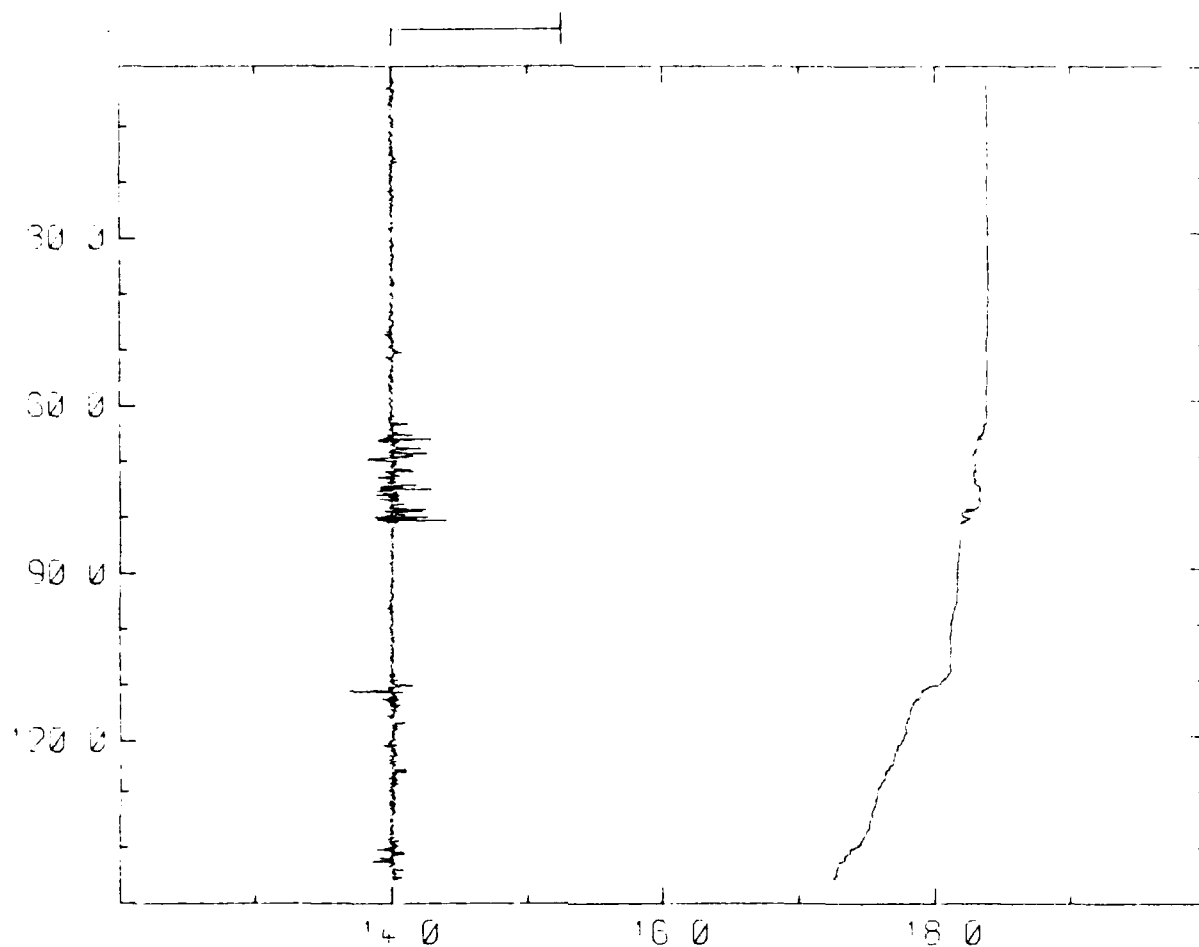
TAPE F7A    FILE 2  
UNIT 2.79



DATE 1/27/80  
TIME 0239 GMT

TAPE F7B FILE 1  
UNIT 2 79  
10 0 DEG/M

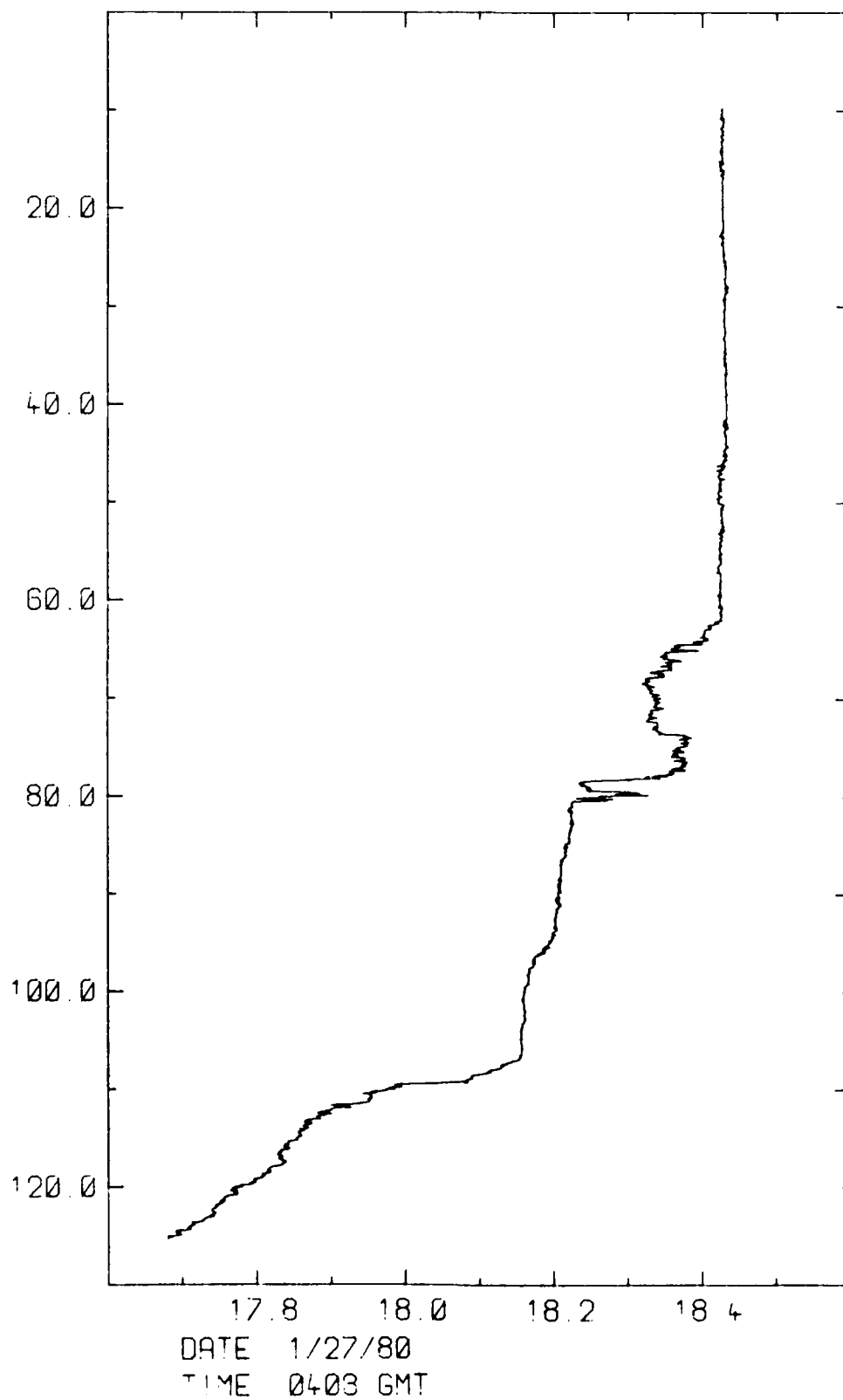
89



DATE 1/27/80  
TIME 0403 GMT

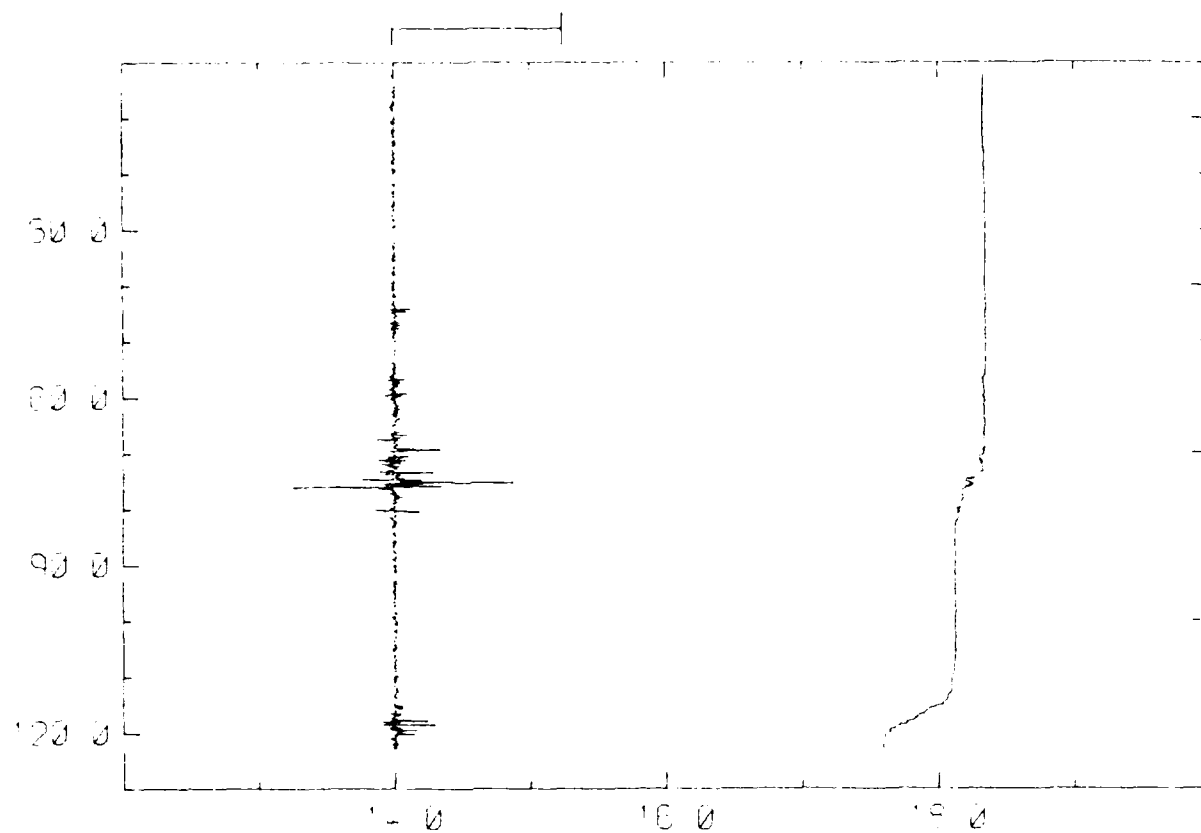


TAPE F7B FILE 1  
UNIT 2.79



TYPE 4.2 FILE 2  
UNIT 2.79

10.0 DEG/M



DATE 1/27/80  
TIME 0-55 GMT

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F/6 8/10

TEMPERATURE MICROSTRUCTURE PROFILES FROM THE SUB-TROPICAL FRONT--ETC(U)

SEP 80 T M DILLON, D R CALDWELL

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201  
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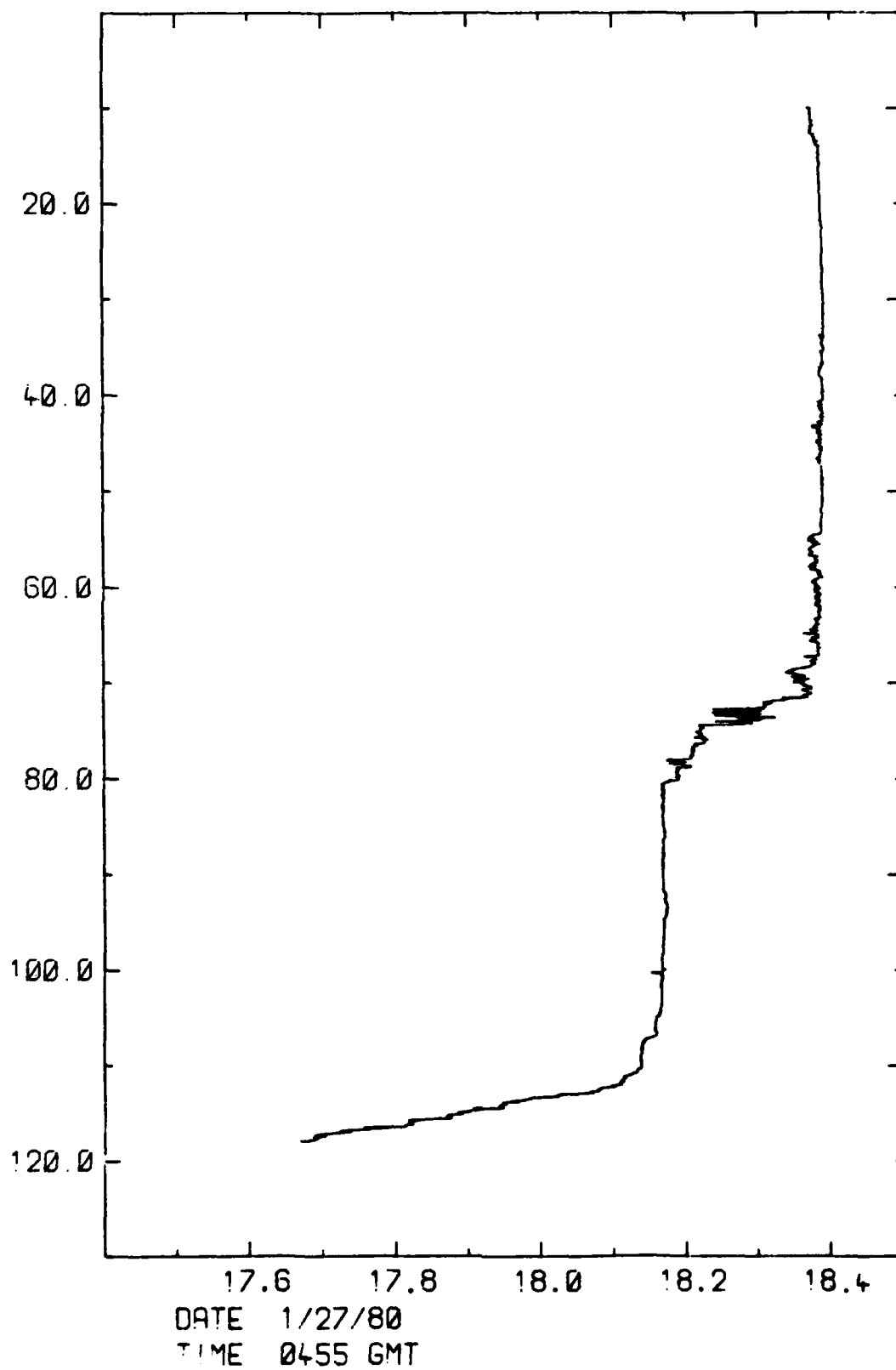



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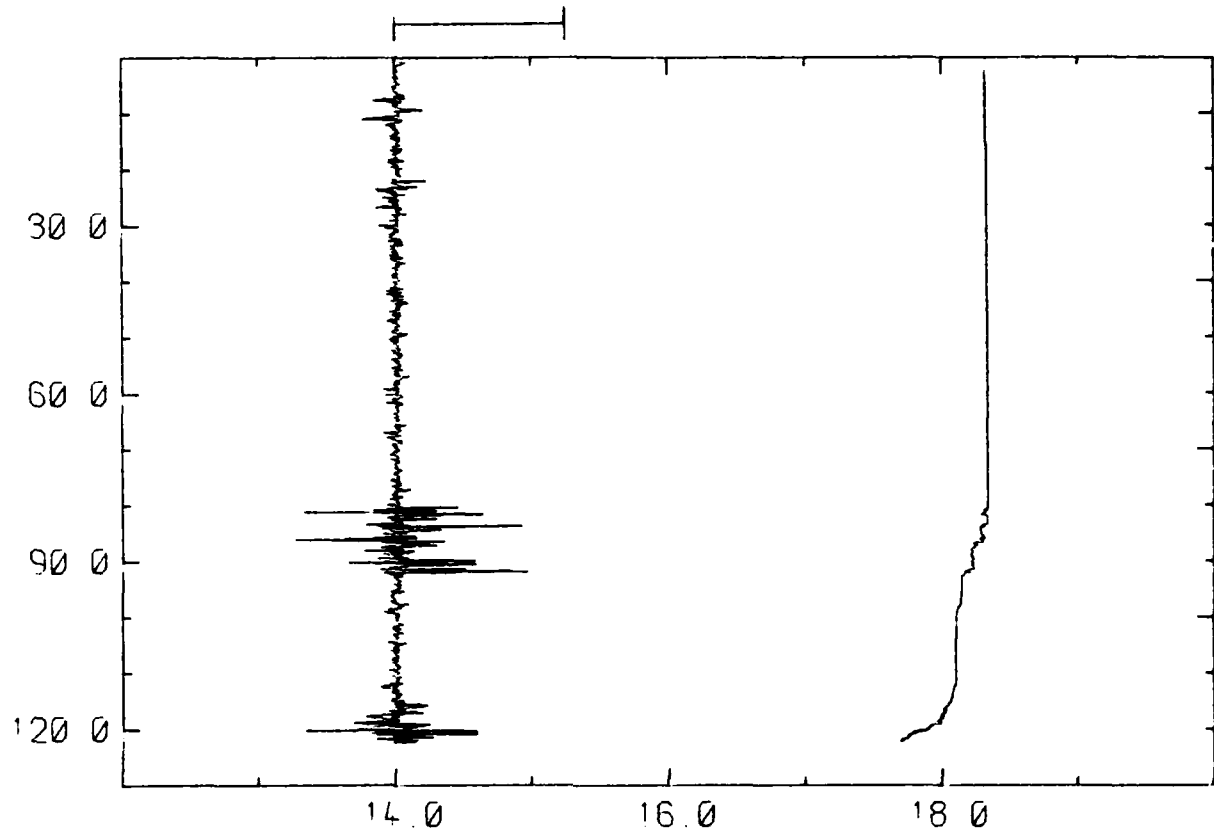
92

TAPE F7B FILE 2  
UNIT 2.79



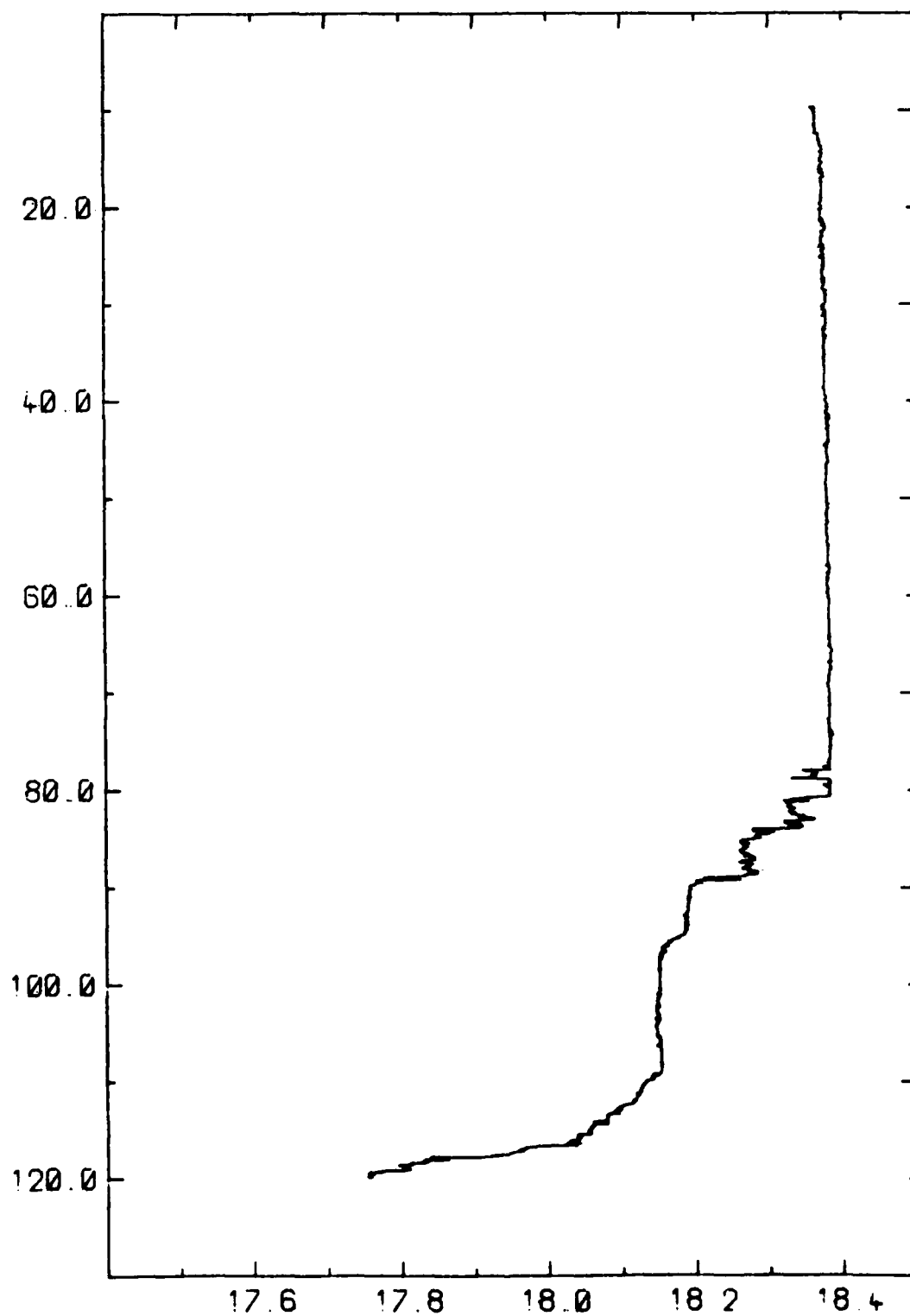
TAPE F7C FILE 1  
UNIT 2.79

3.0 DEG/M



DATE 1/27/80  
TIME 0529 GMT

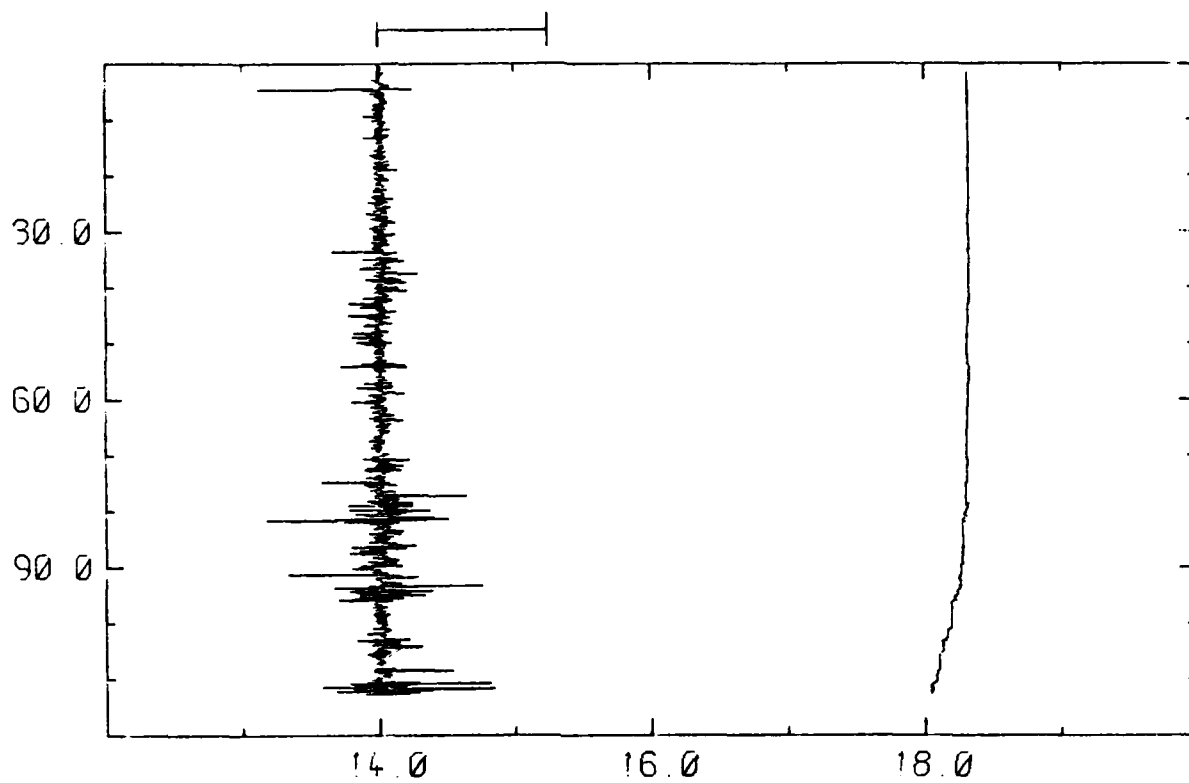
TAPE F7C FILE 1  
UNIT 2.79



DATE 1/27/80  
TIME 0429 GMT

TAPE F7C FILE 2  
UNIT 2.79

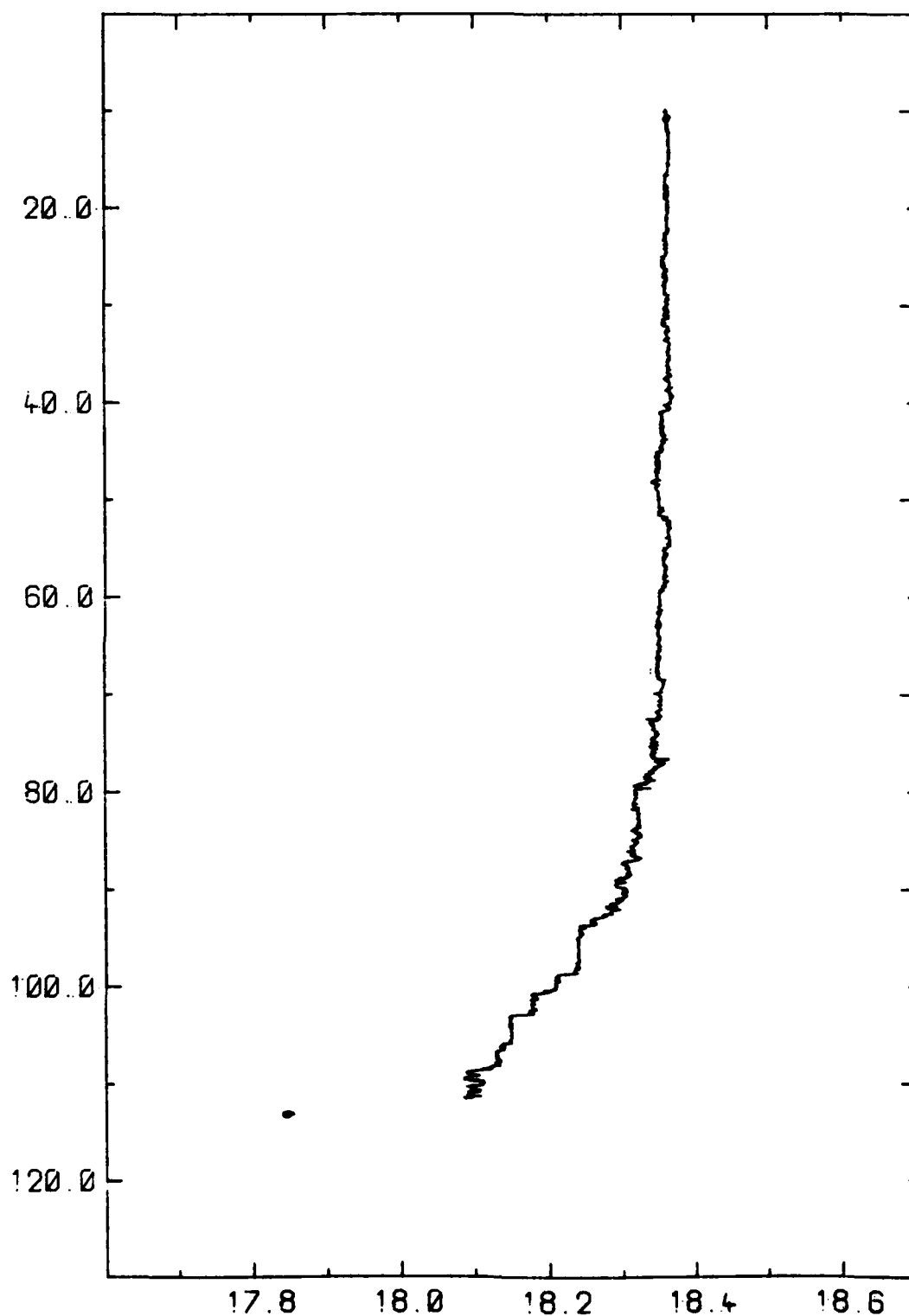
3.0 DEG/M



DATE 1/27/80  
TIME 0549 GMT

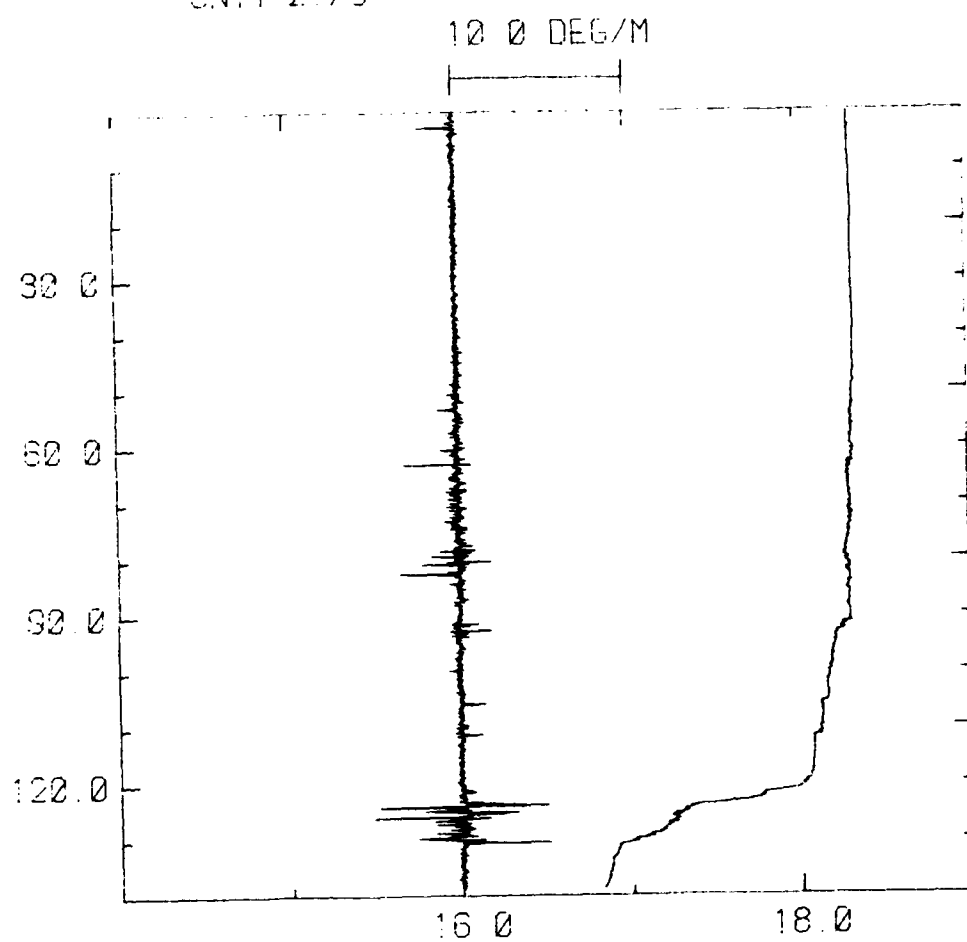


TAPE F7C    FILE 2  
UNIT 2.79



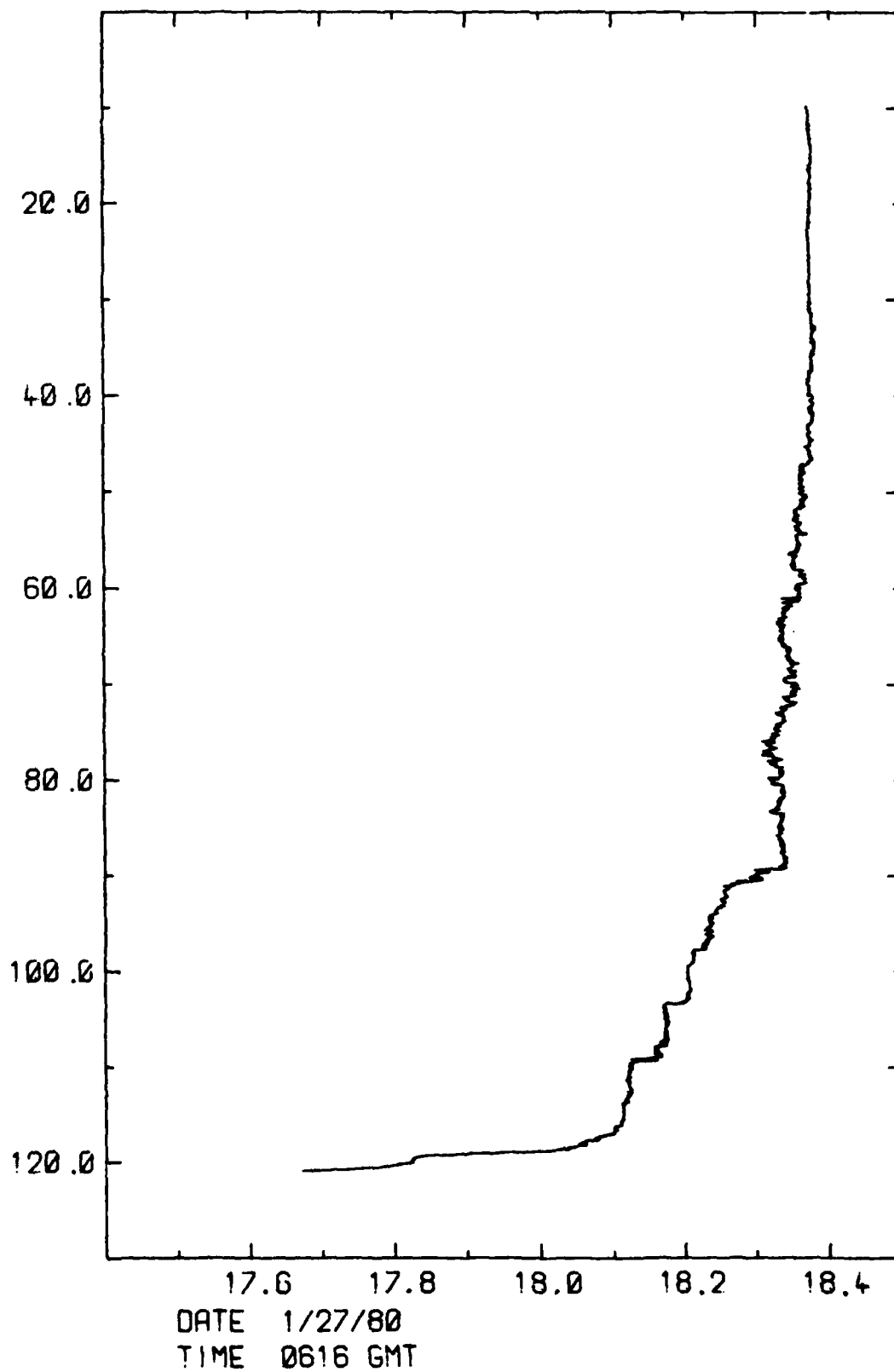
DATE 1/27/80  
TIME 0449 GMT

TAPE F7C FILE 5  
UNIT 2.79

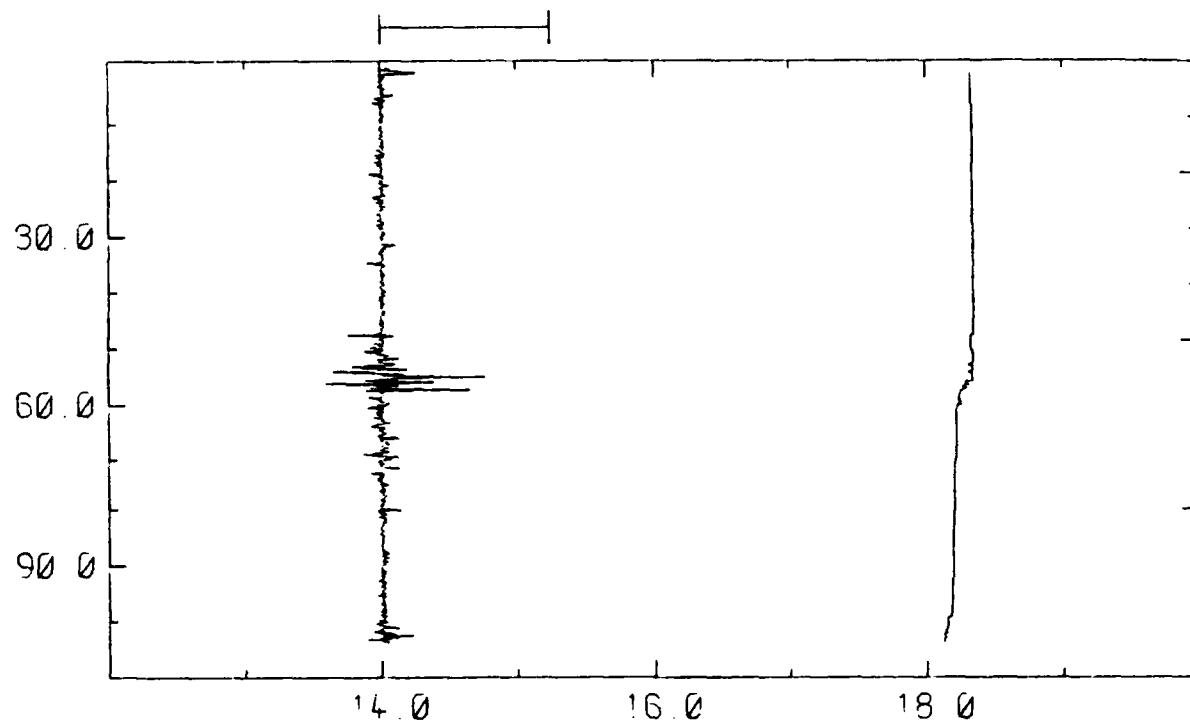


DATE 1/27/80  
TIME 0616 GMT

TAPE F7C FILE 5  
UNIT 2.79



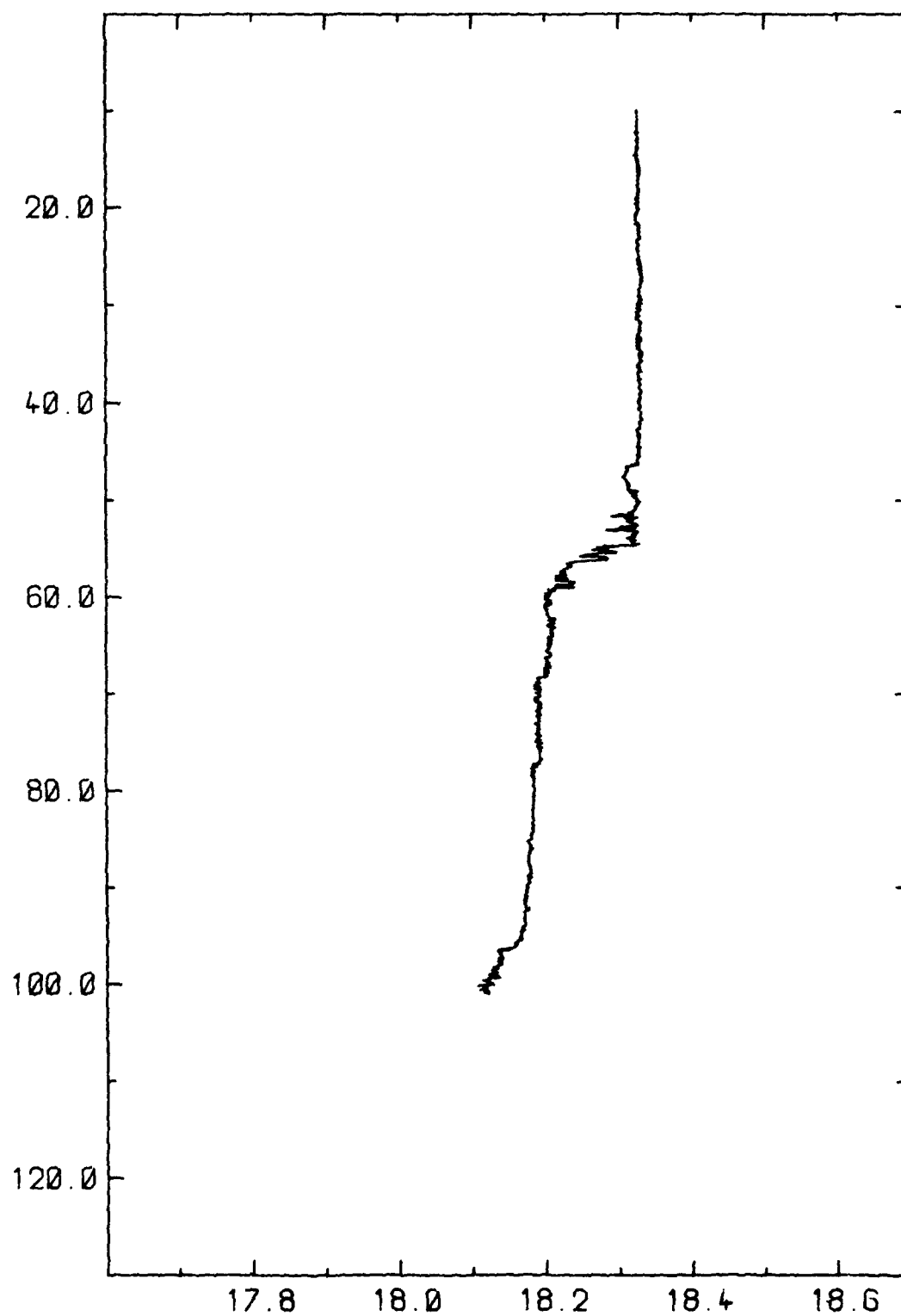
TAPE F7D FILE 1  
UNIT 7 79  
3.0 DEG/M



DATE 1/27/80  
TIME 0743 GMT

100

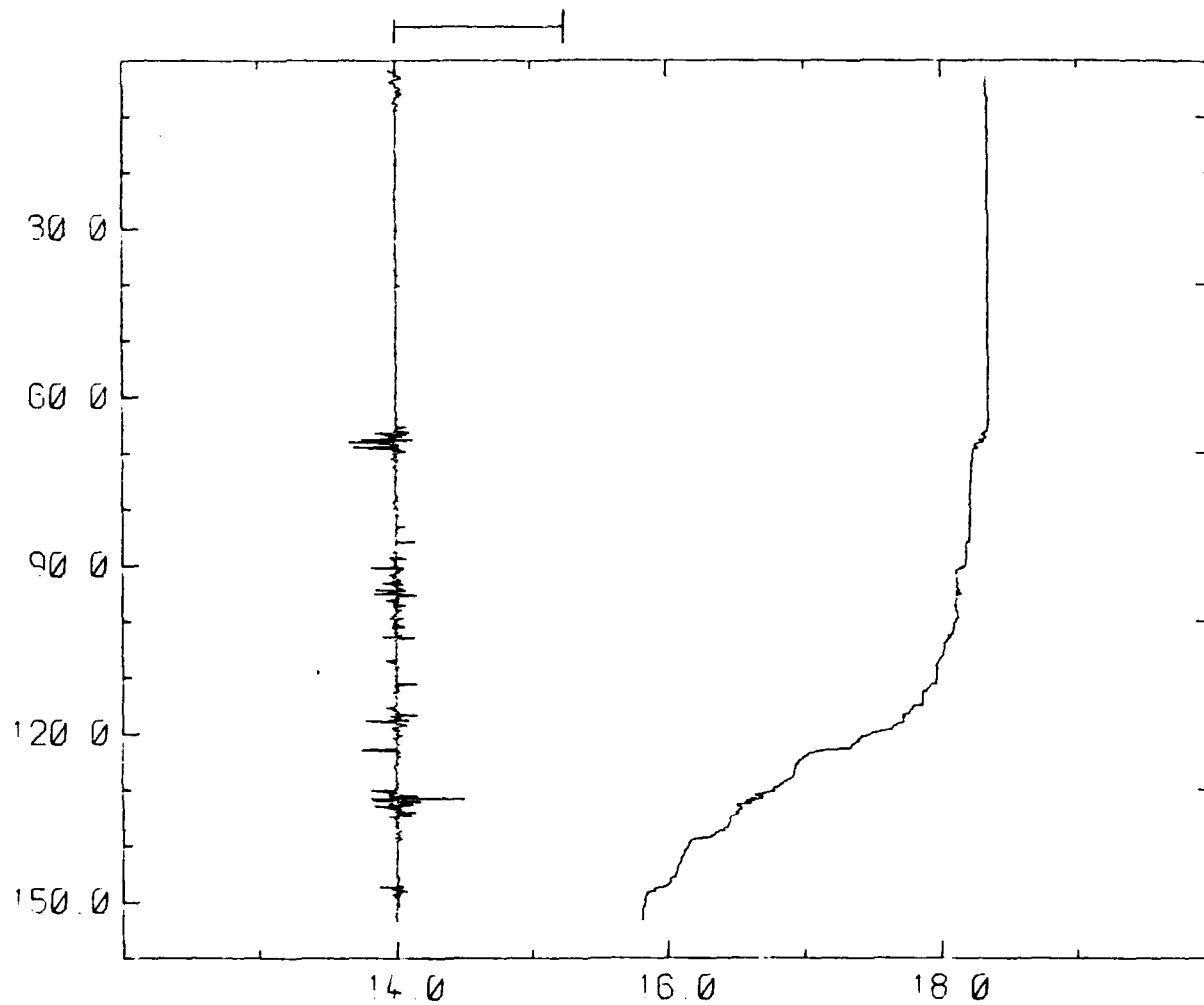
TAPE F70 FILE 1  
UNIT 7.79



DATE 1/27/80  
TIME 0743 GMT

TAPE F7D FILE 2  
UNIT 7.79

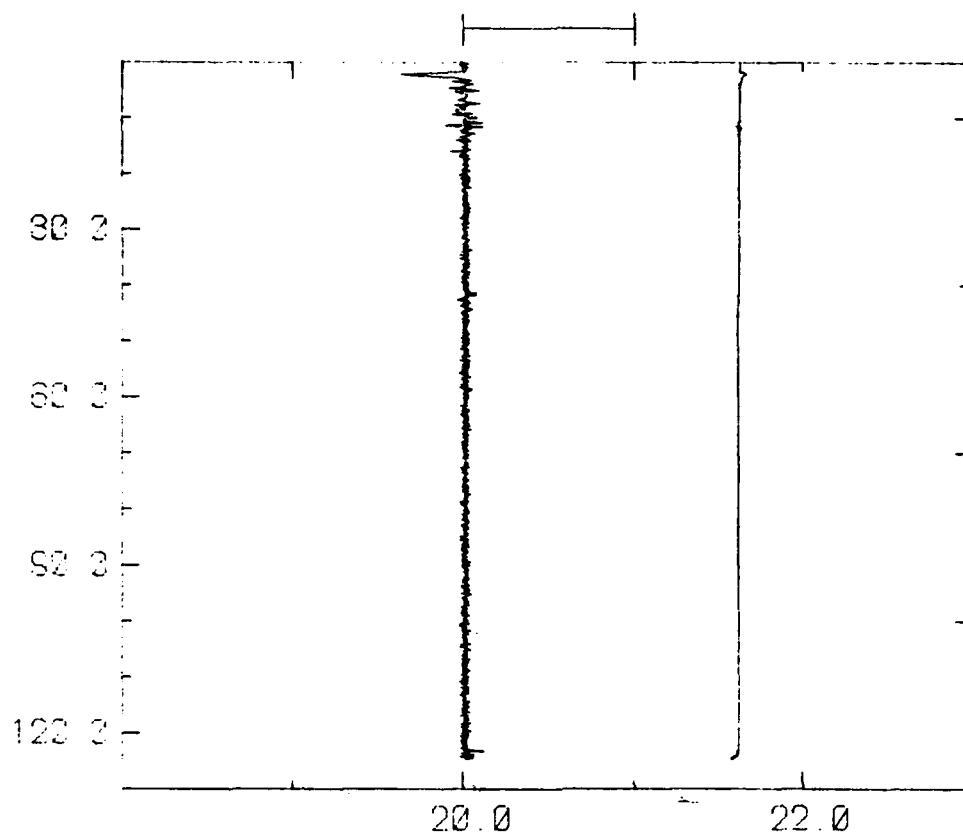
10.0 DEG/M



DATE 1/27/80  
TIME 0758 GMT

TAPE F8A    FILE 5  
UNIT 7.79

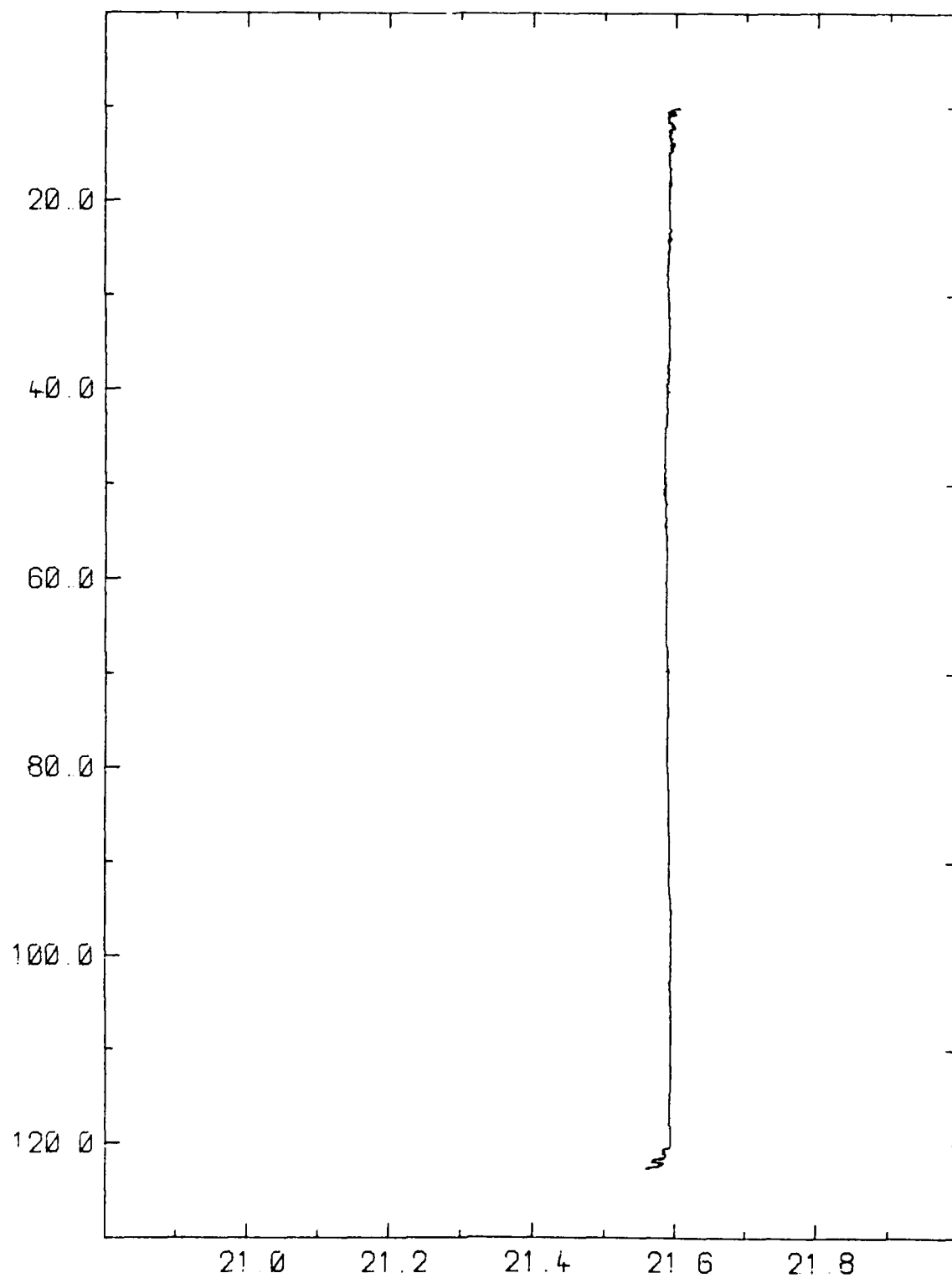
3.0 DEG/M



DATE 1/28/80  
TIME 2118 GMT

TAPE F8A FILE 5  
UNIT 7.79

103



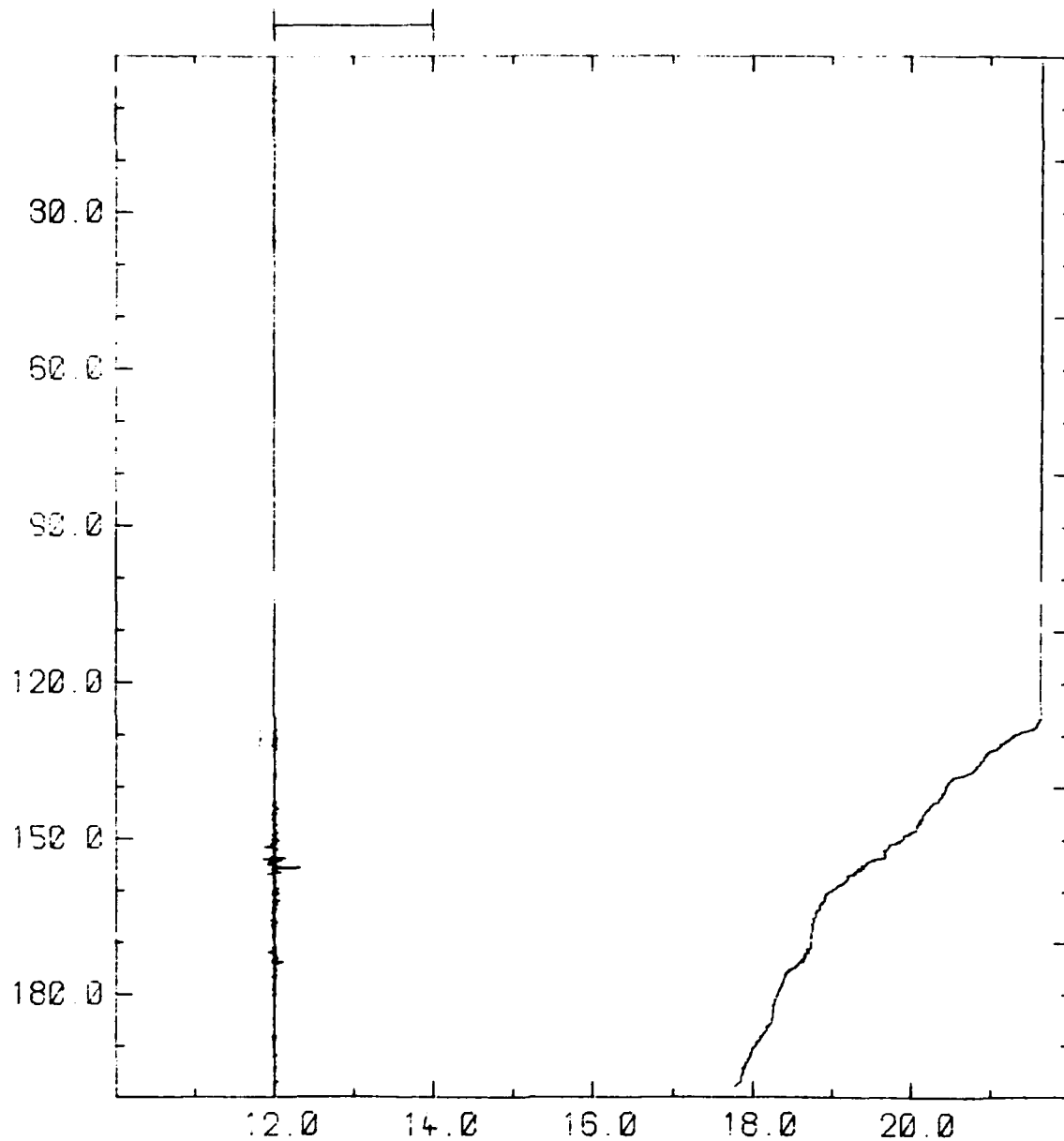
DATE 1/28/80  
TIME 2118 GMT



TAPE F8A FILE 6

UNIT 7.79

30.0 DEG/M

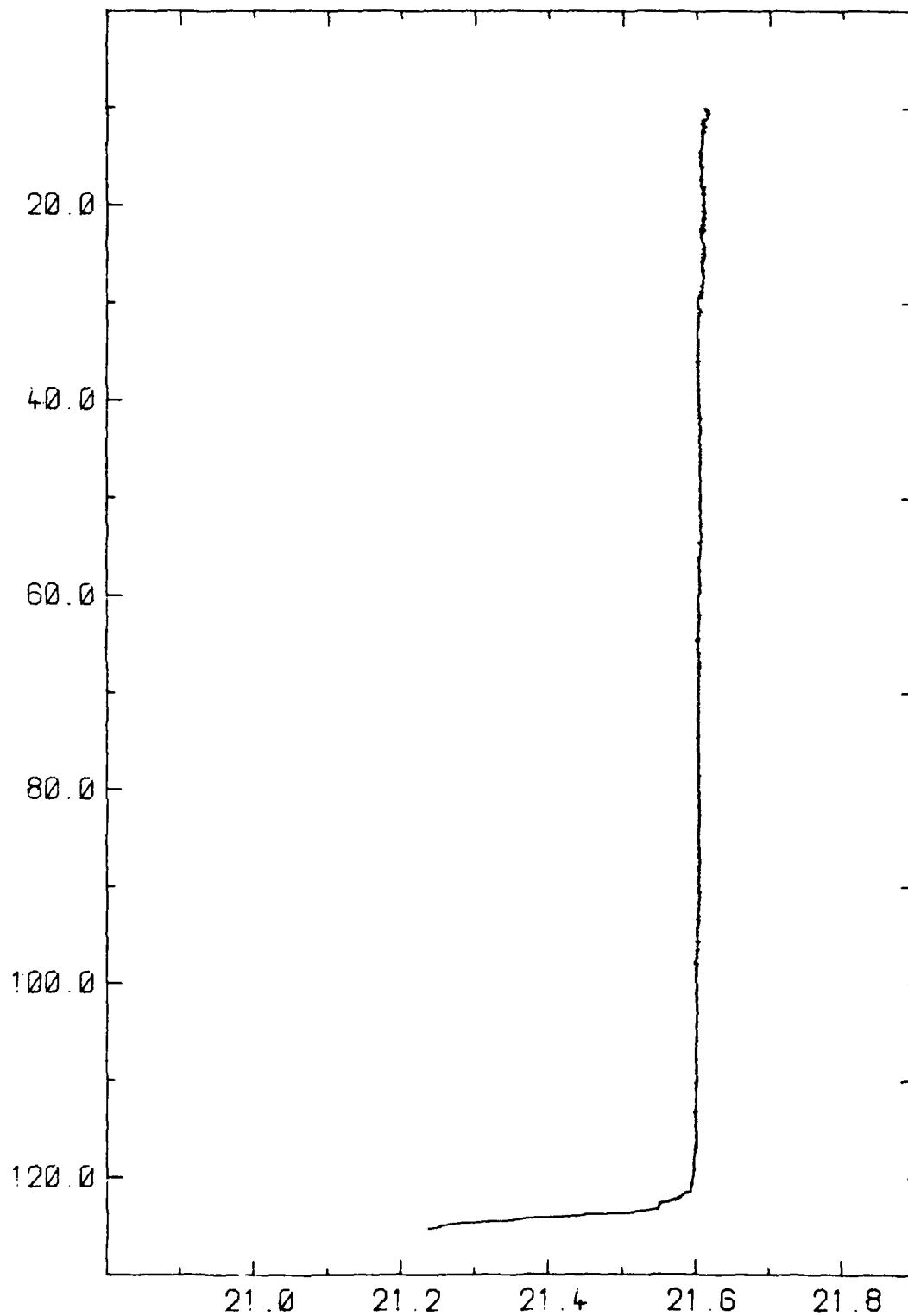


DATE 1/28/80

TIME 2147 GMT

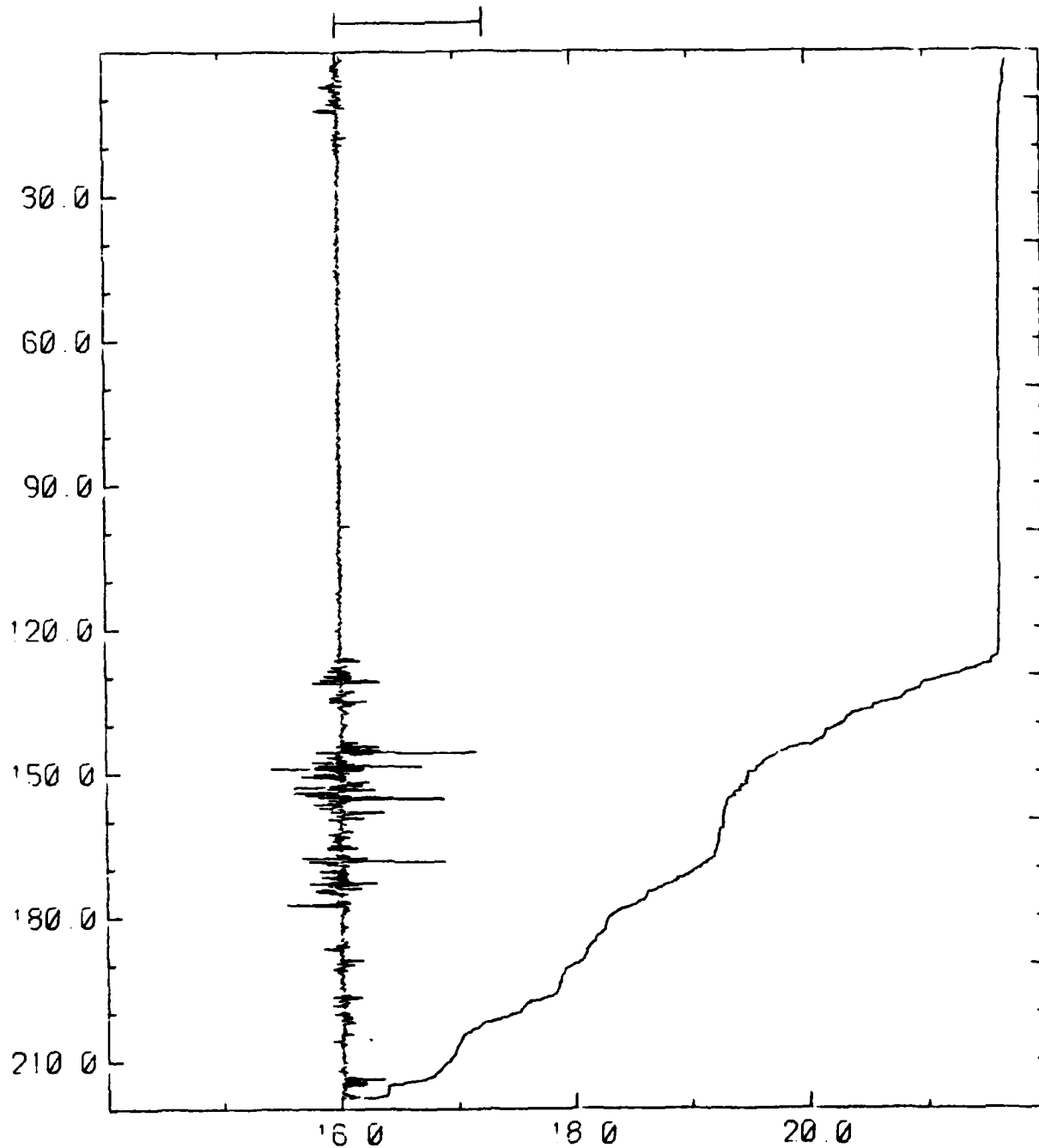
TAPE F8A    FILE 6  
UNIT 7.79

105



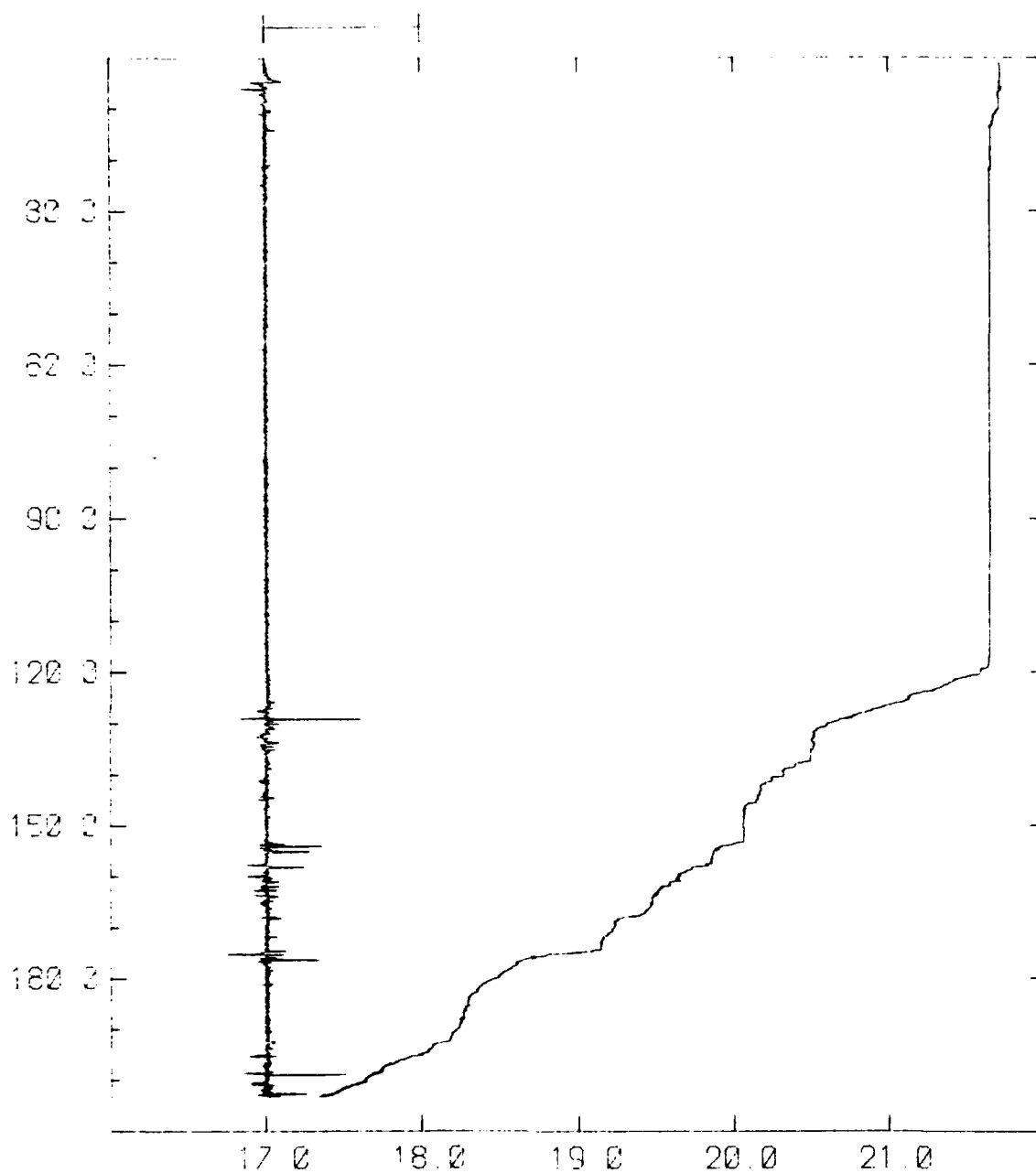
DATE 1/28/80  
TIME 2147 GMT

TAPE F8B FILE 1  
UNIT 7.79  
3.0 DEG/M



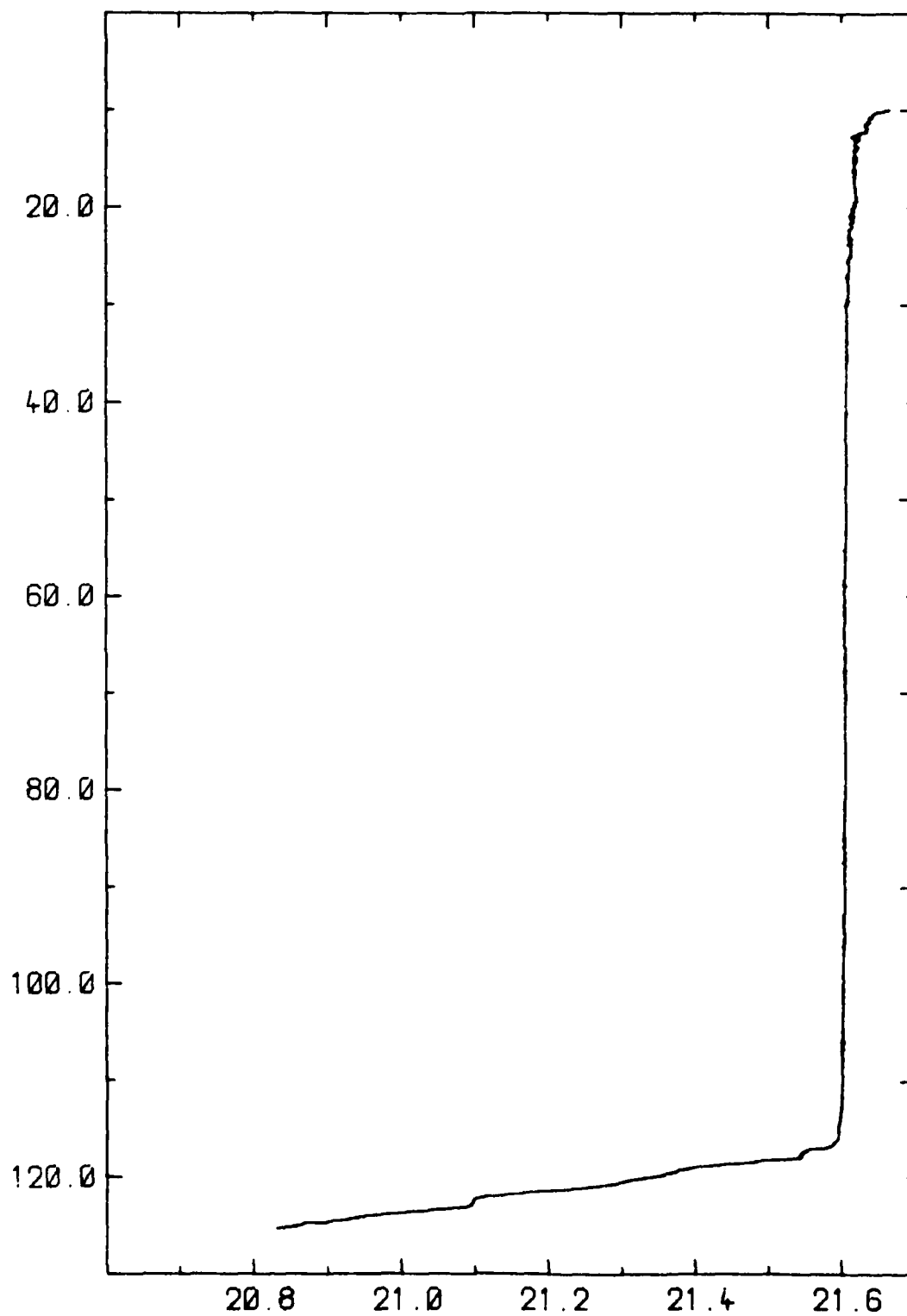
DATE 1/28/80  
TIME 2236 GMT

TAPE F8B FILE 2  
UNIT 7.79  
10 0 DEG/M



DATE 1/28/80  
TIME 2312 GMT

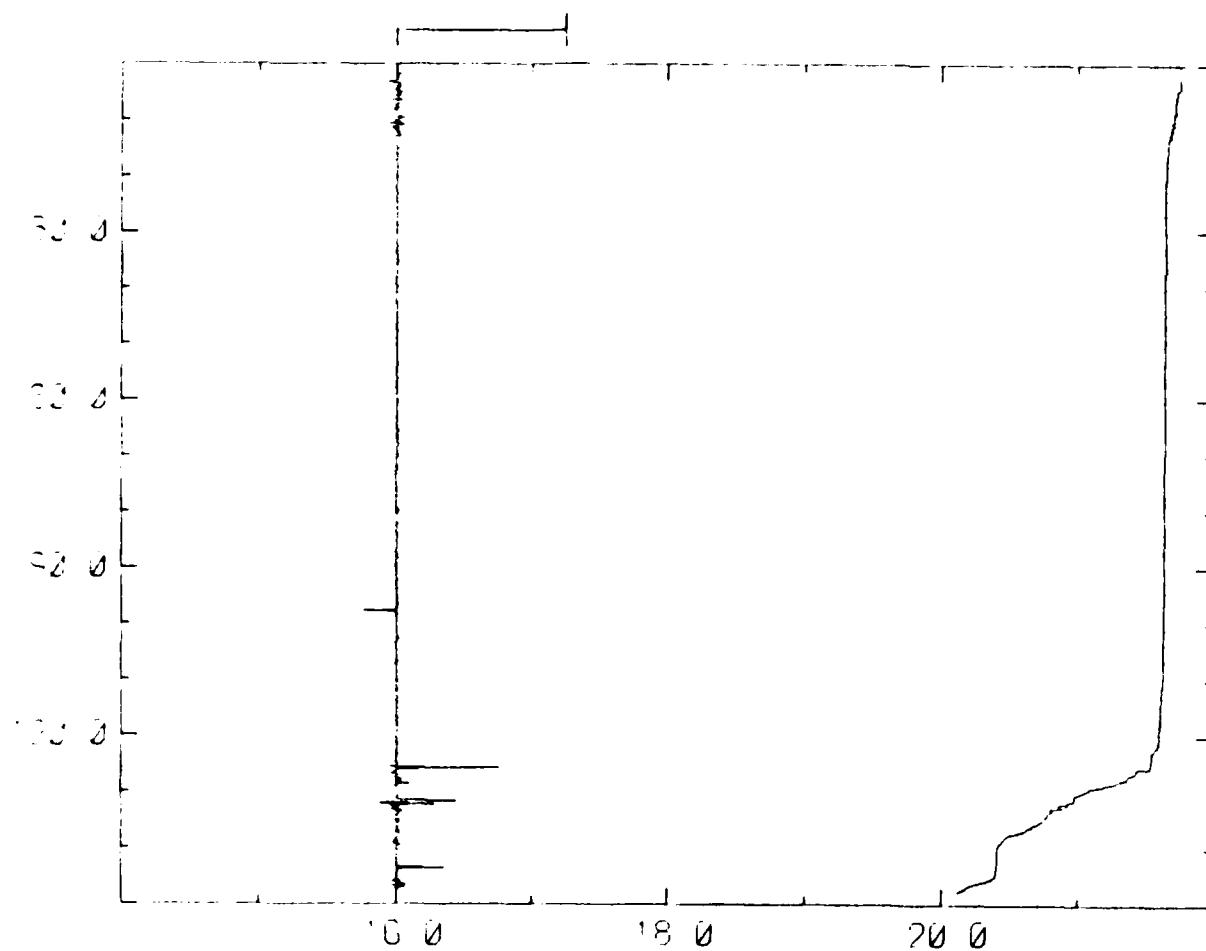
TAPE F8B    FILE 2  
UNIT 7.79



DATE 1/28/80  
TIME 2312 GMT

TAPE F80 FILE 1  
UNIT 7 79

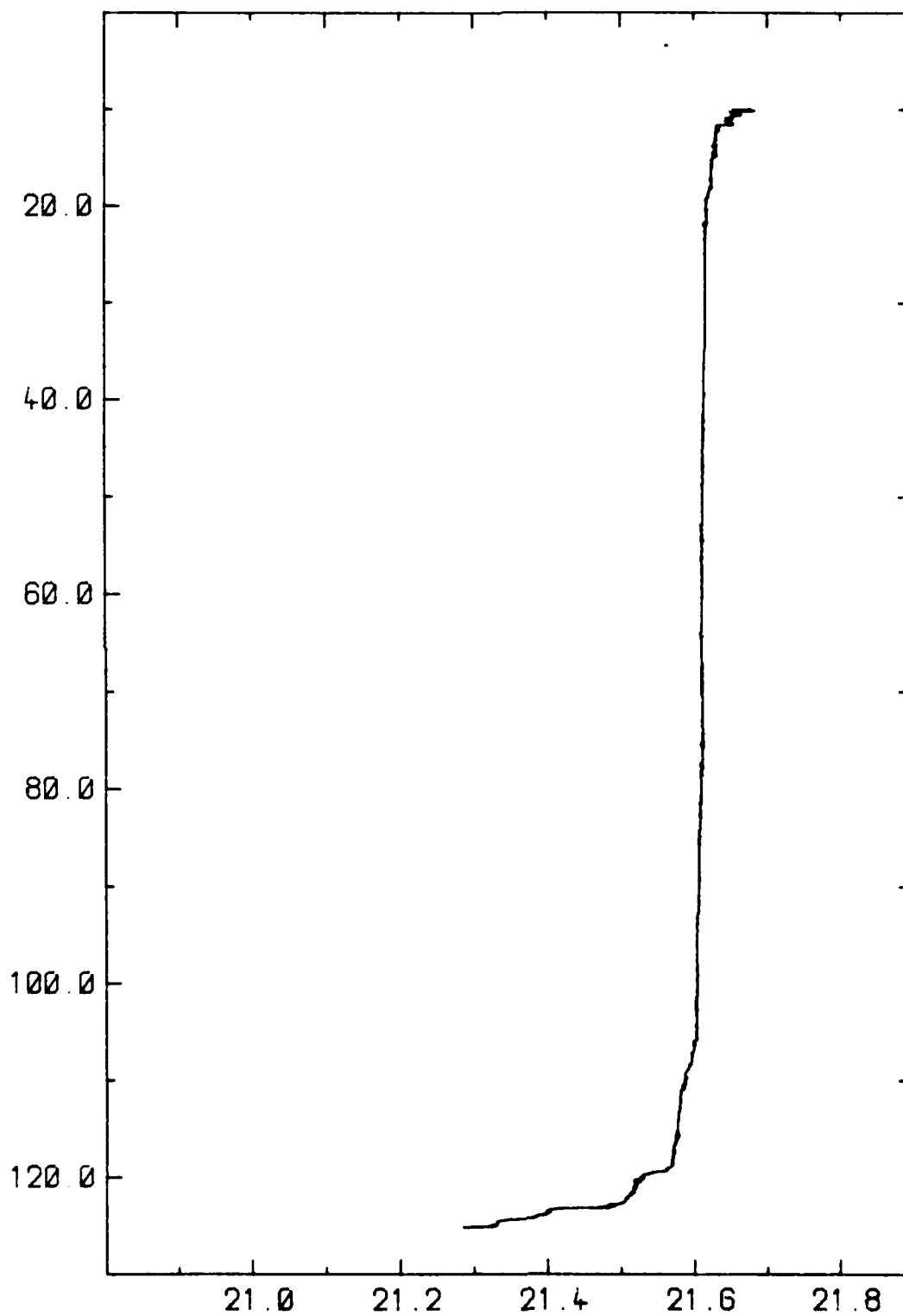
10 0 DEG/M



DATE 1/28/80  
TIME 2346 GMT

110

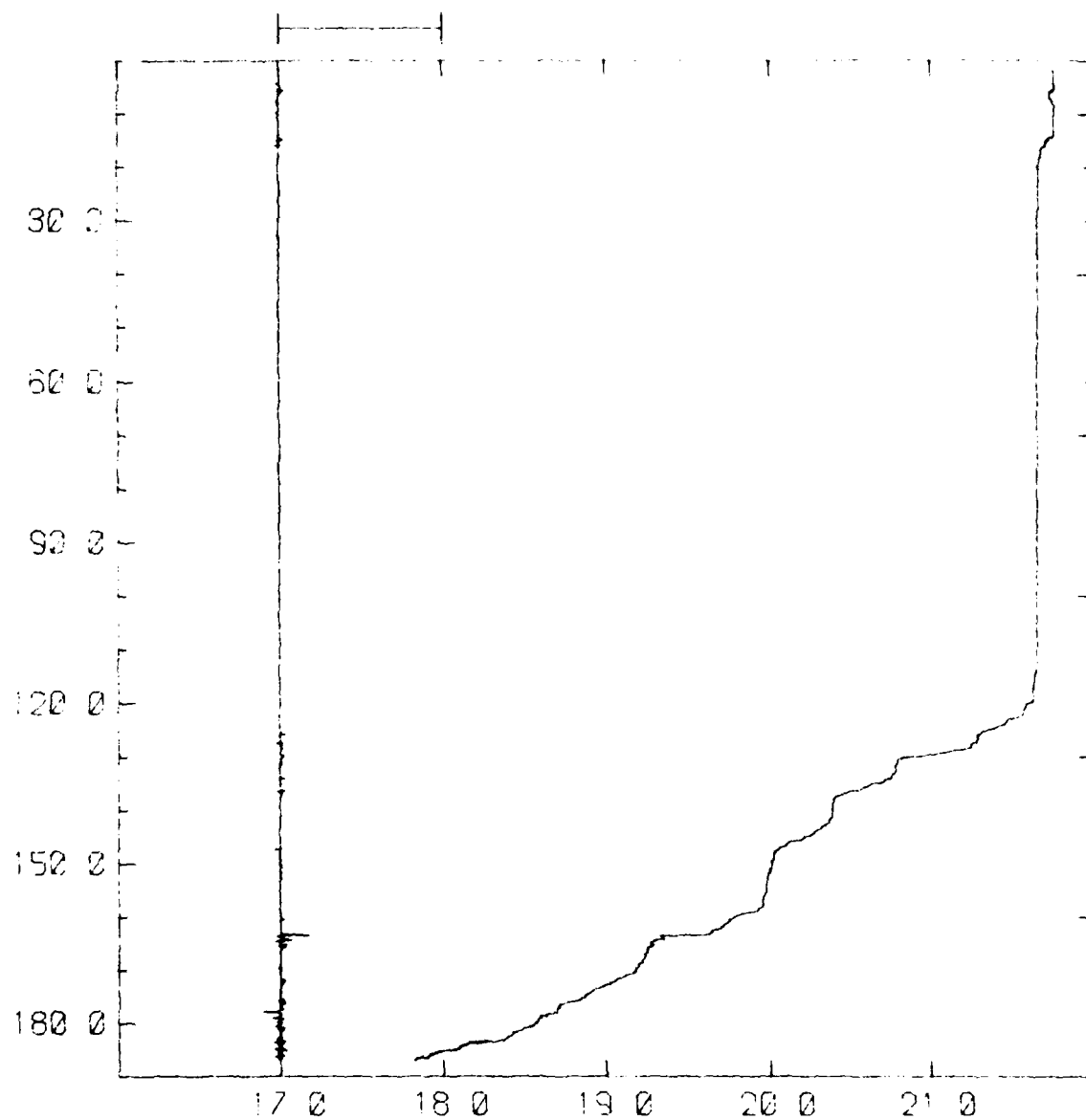
TAPE F8C    FILE 1  
UNIT 7.79



DATE 1/28/80  
TIME 2346 GMT

TAPE F80 FILE 2  
UNIT 7 79  
30.0 DEG/M

111

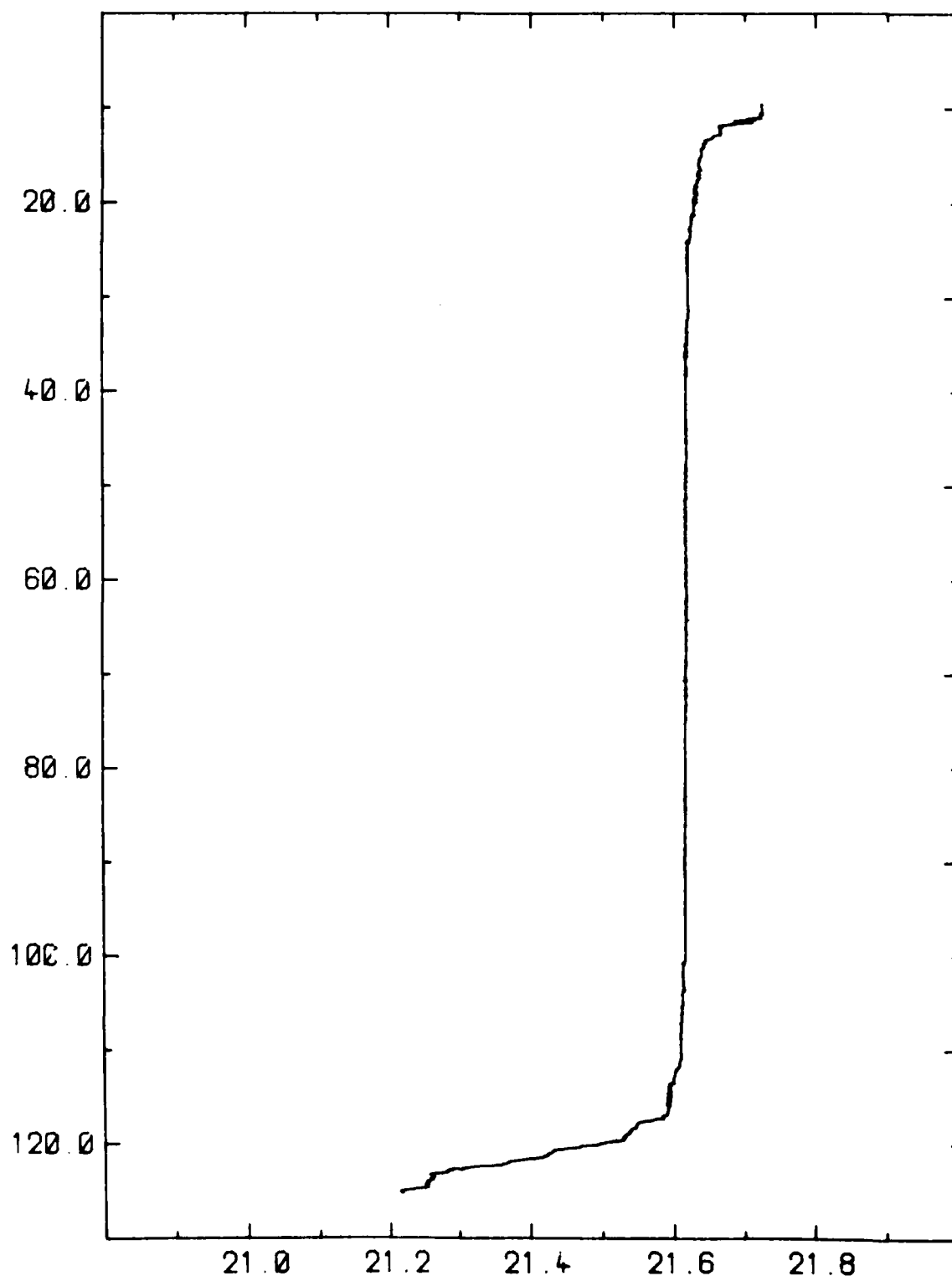


DATE 1/28/80  
TIME 0019 GMT



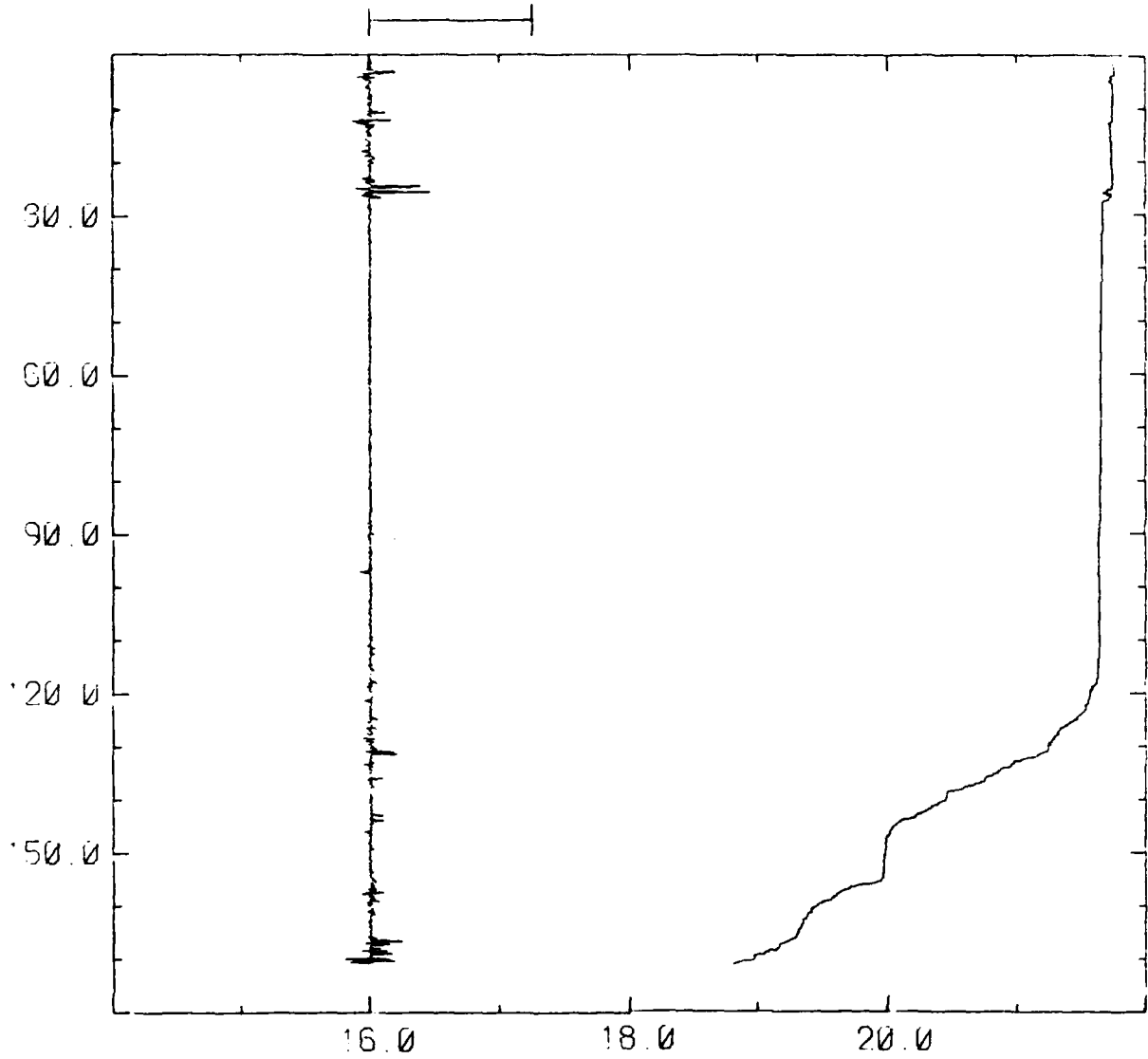
112

TAPE F8C    FILE 2  
UNIT 7.79



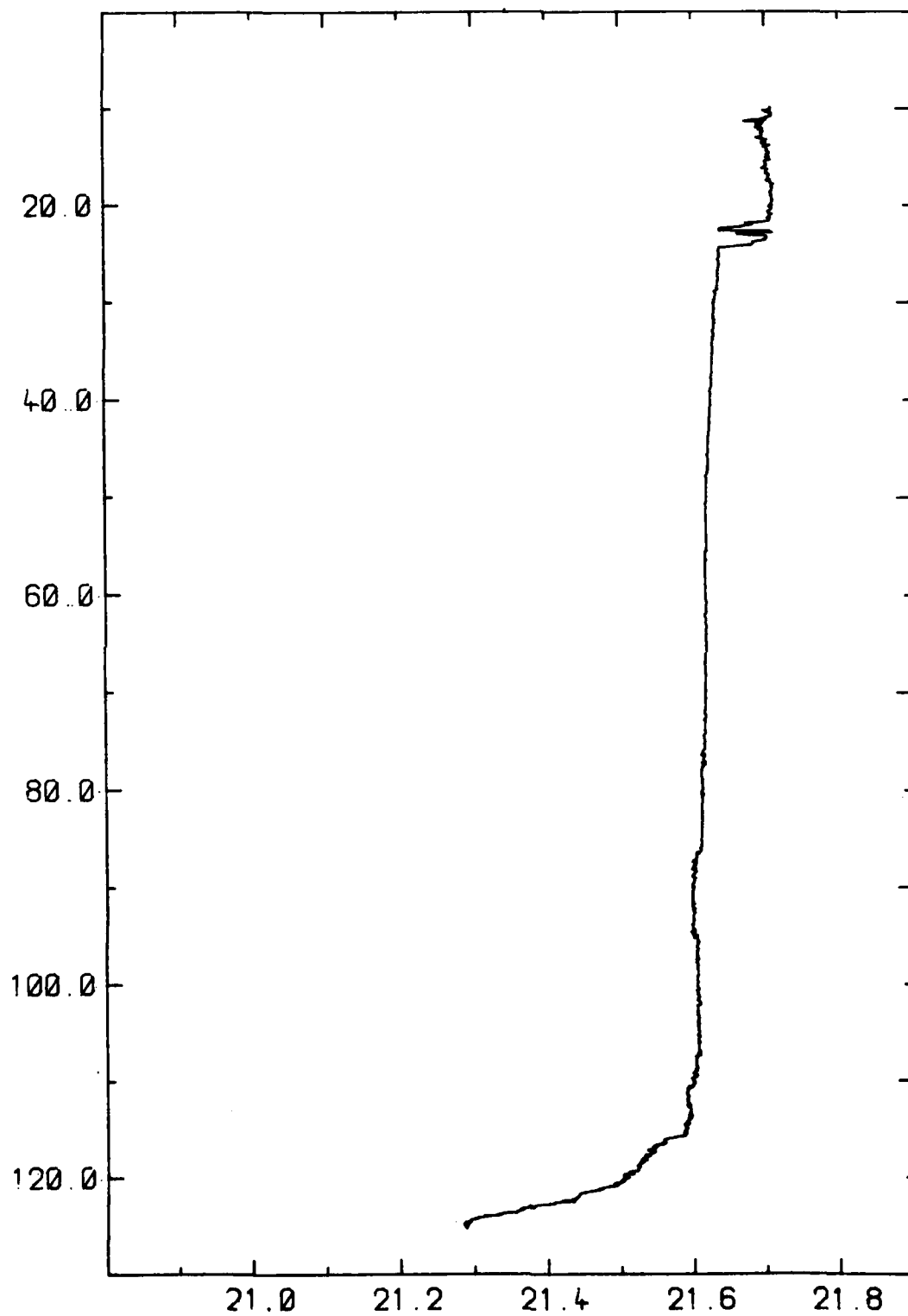
DATE 1/29/80  
TIME 0019 GMT

TAPE F8D FILE 1  
UNIT 7.79  
10.0 DEG/M



DATE 1/29/80  
TIME 0055 GMT

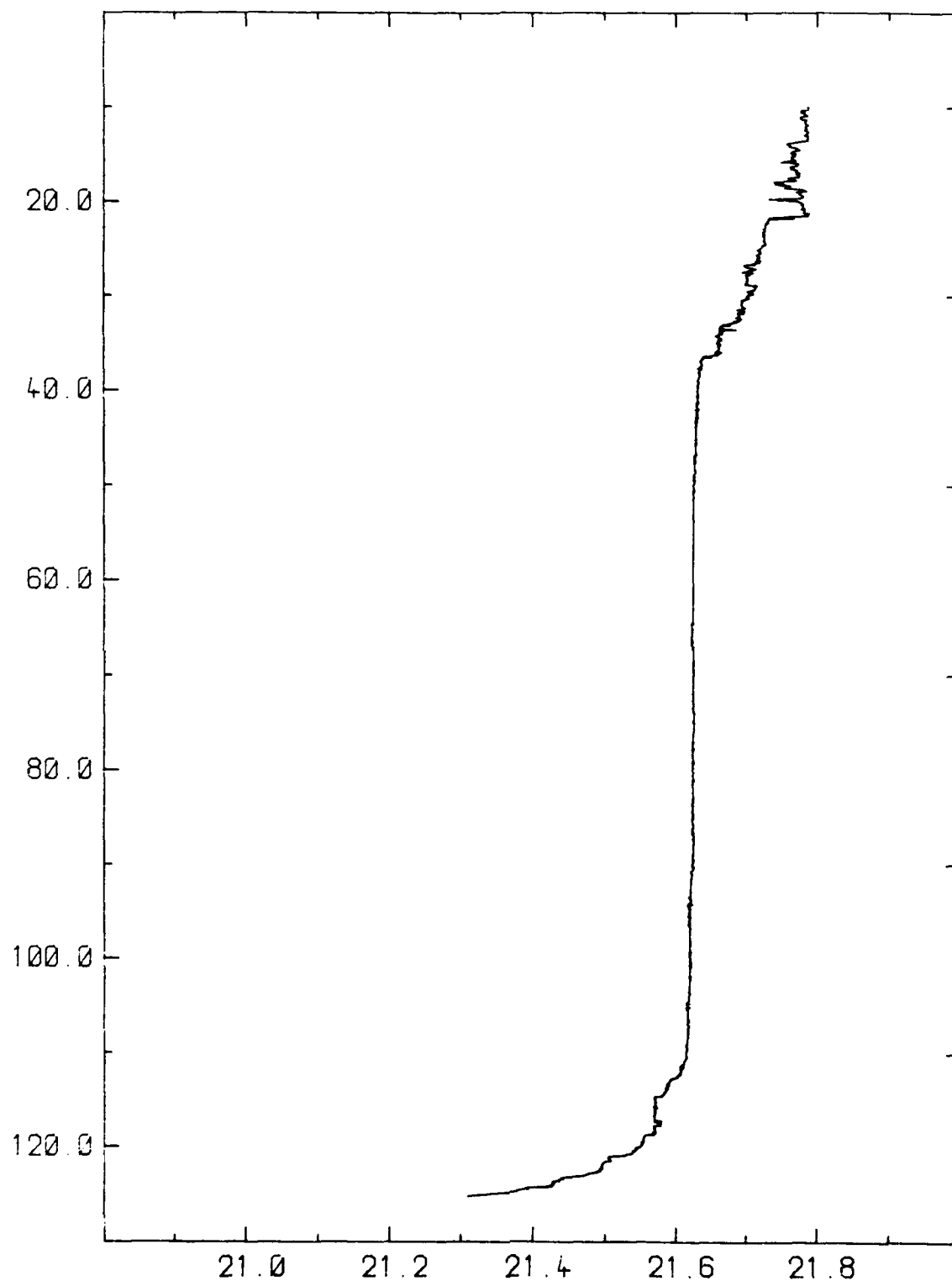
TAPE F8D FILE 1  
UNIT 7.79



DATE 1/29/80  
TIME 0055 GMT

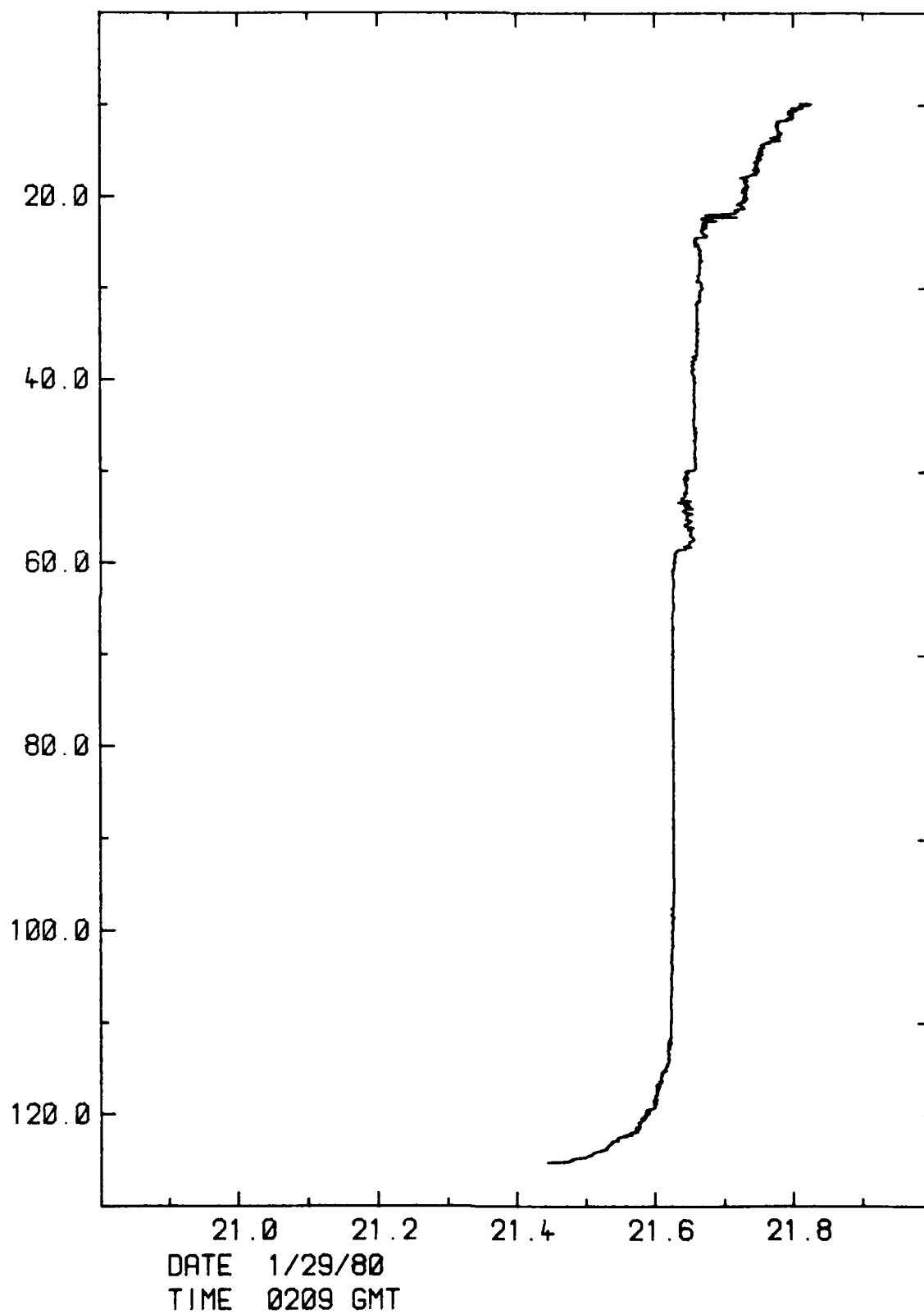
TAPE F8D    FILE 3  
UNIT 7.79

115



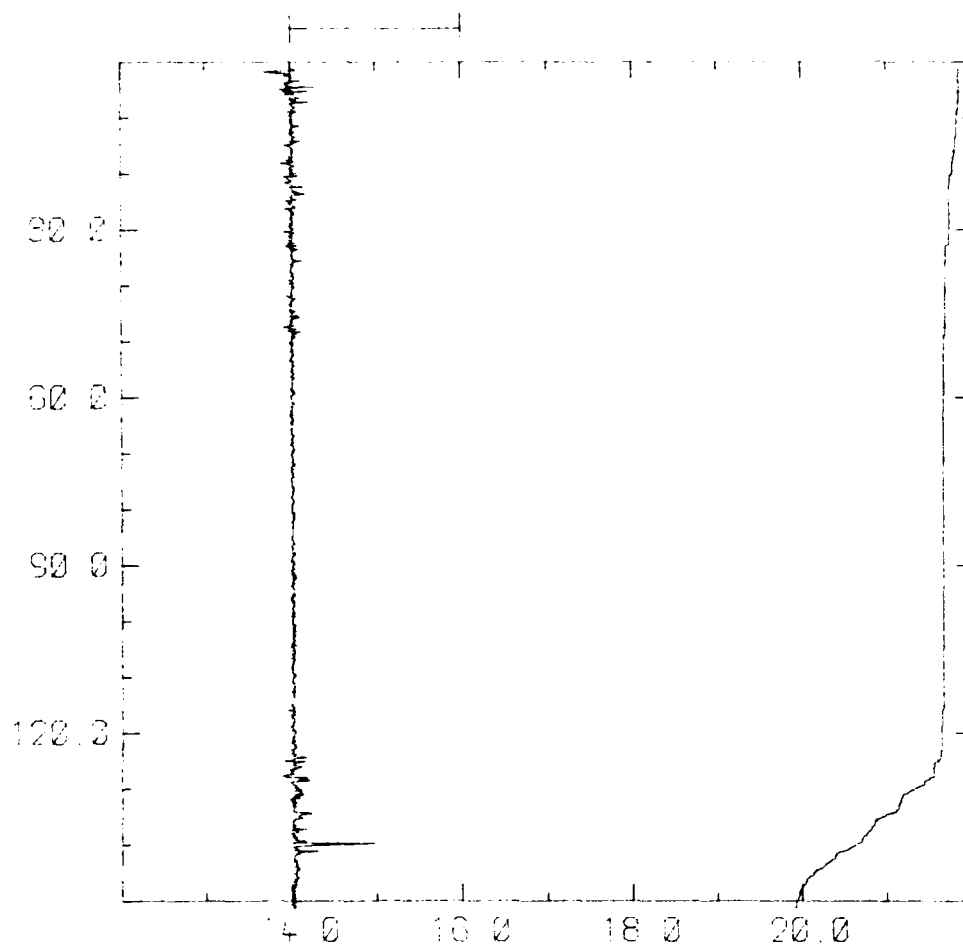
DATE 1/29/80  
TIME 0135 GMT

TAPE F8E    FILE 1  
UNIT 7.79



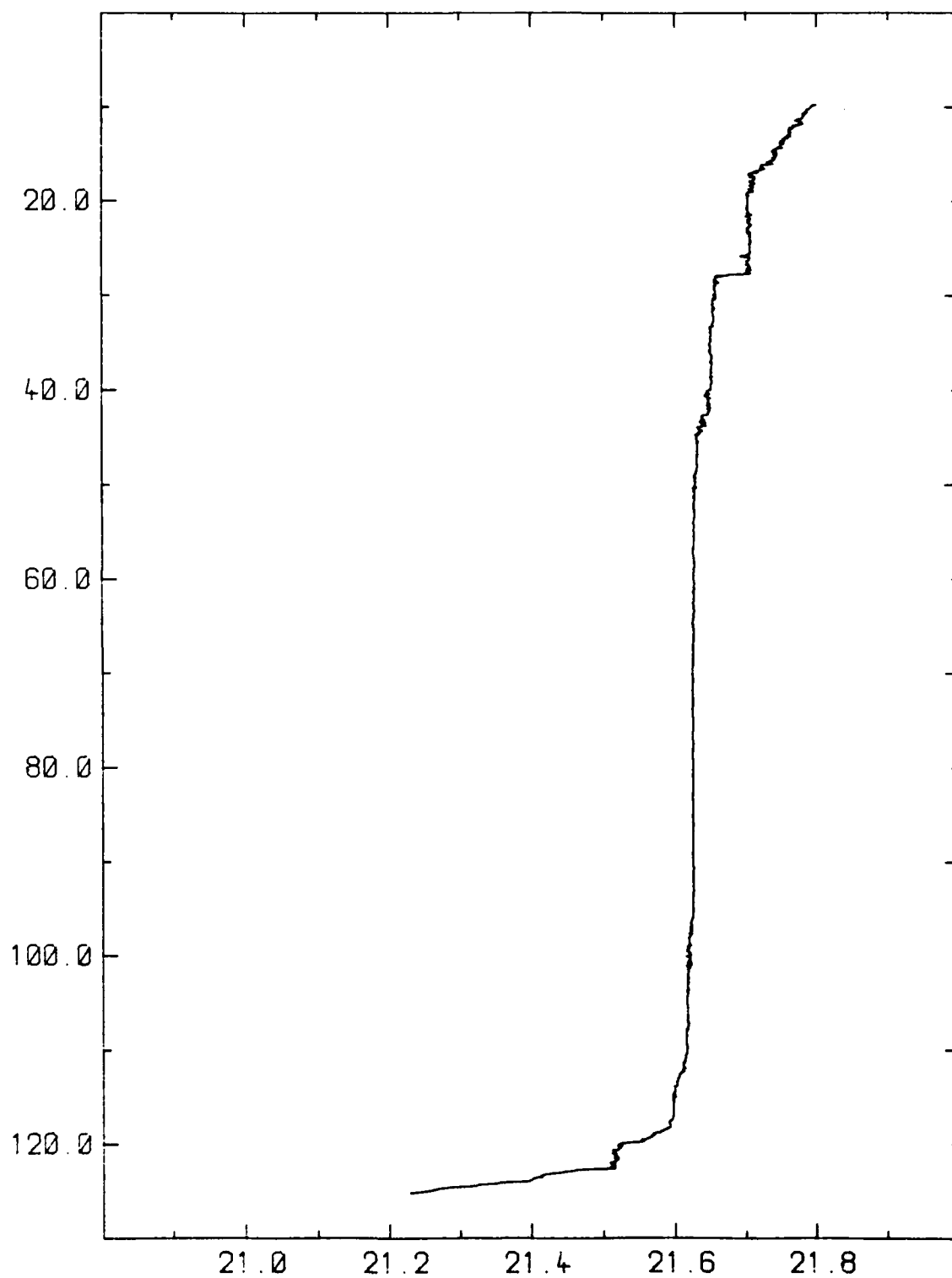
TAPE F8E FILE 2  
UNIT 7 79  
S 0 DEG/M

117



DATE 1/29/60  
TIME 0229 GMT

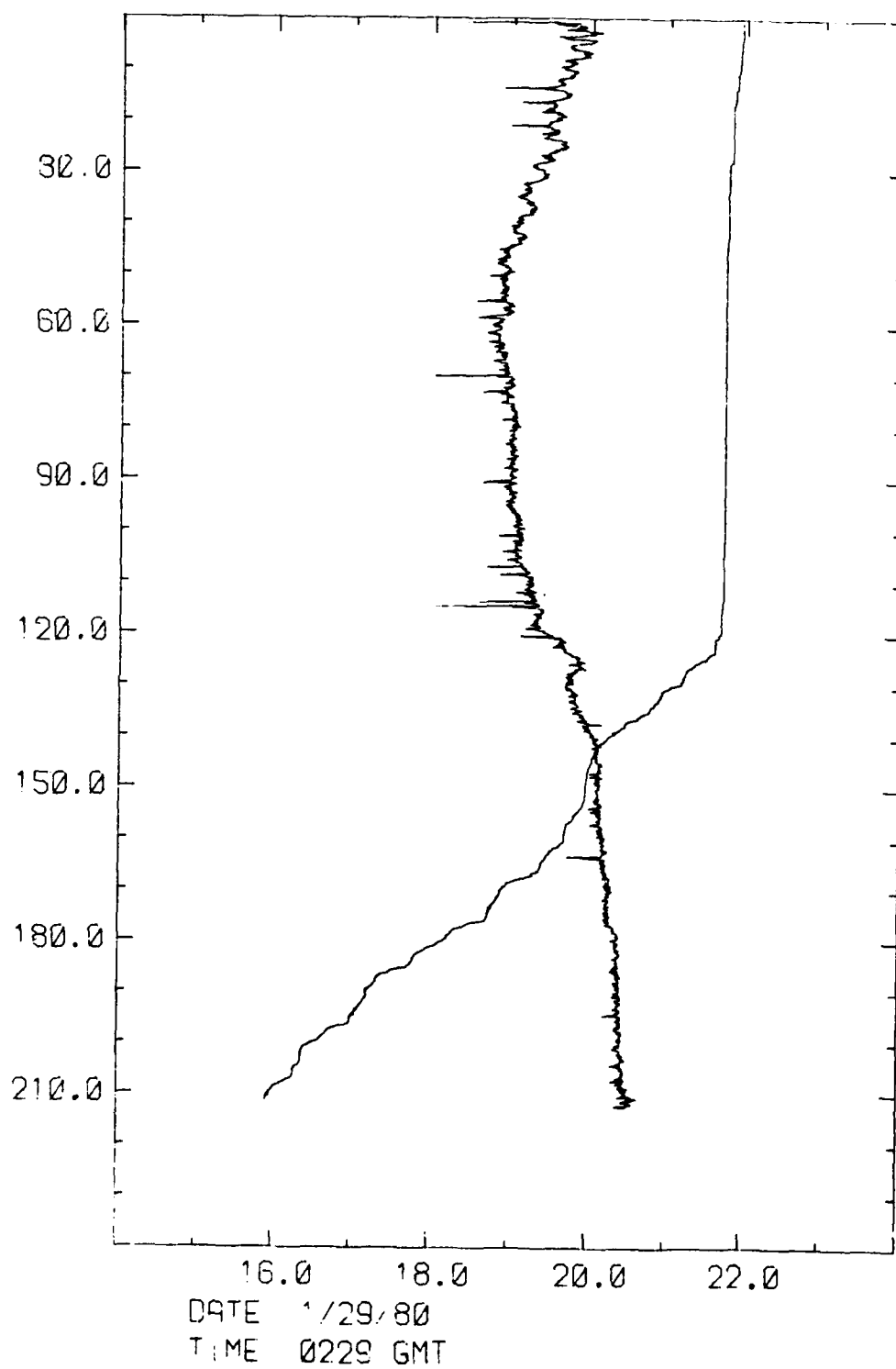
TAPE F8E    FILE 2  
UNIT 7.79



DATE 1/29/80  
TIME 0229 GMT

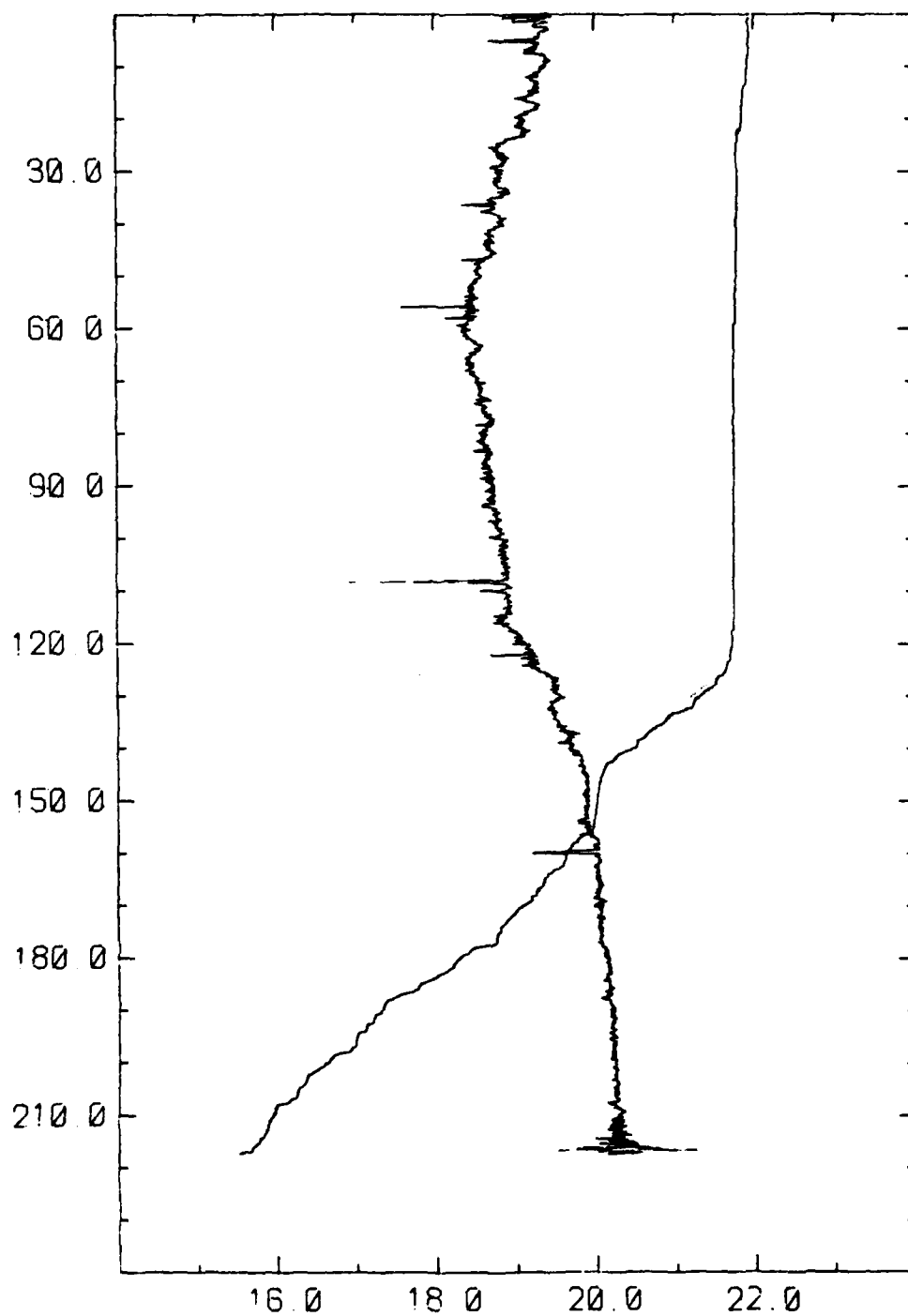
TAPE F8E FILE 2  
UNIT 7 79

119



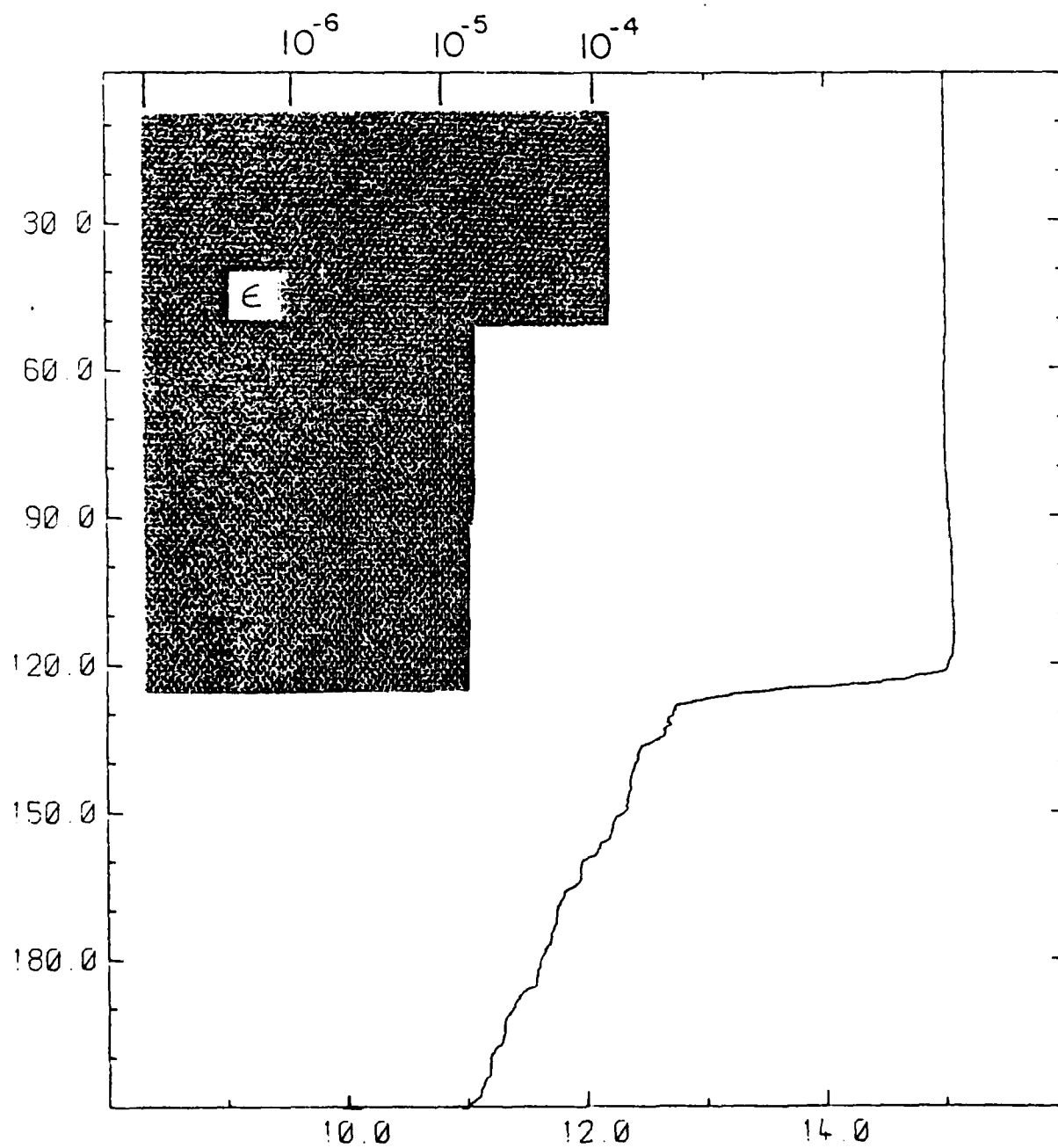


TAPE F8E    FILE 1  
UNIT 7.79



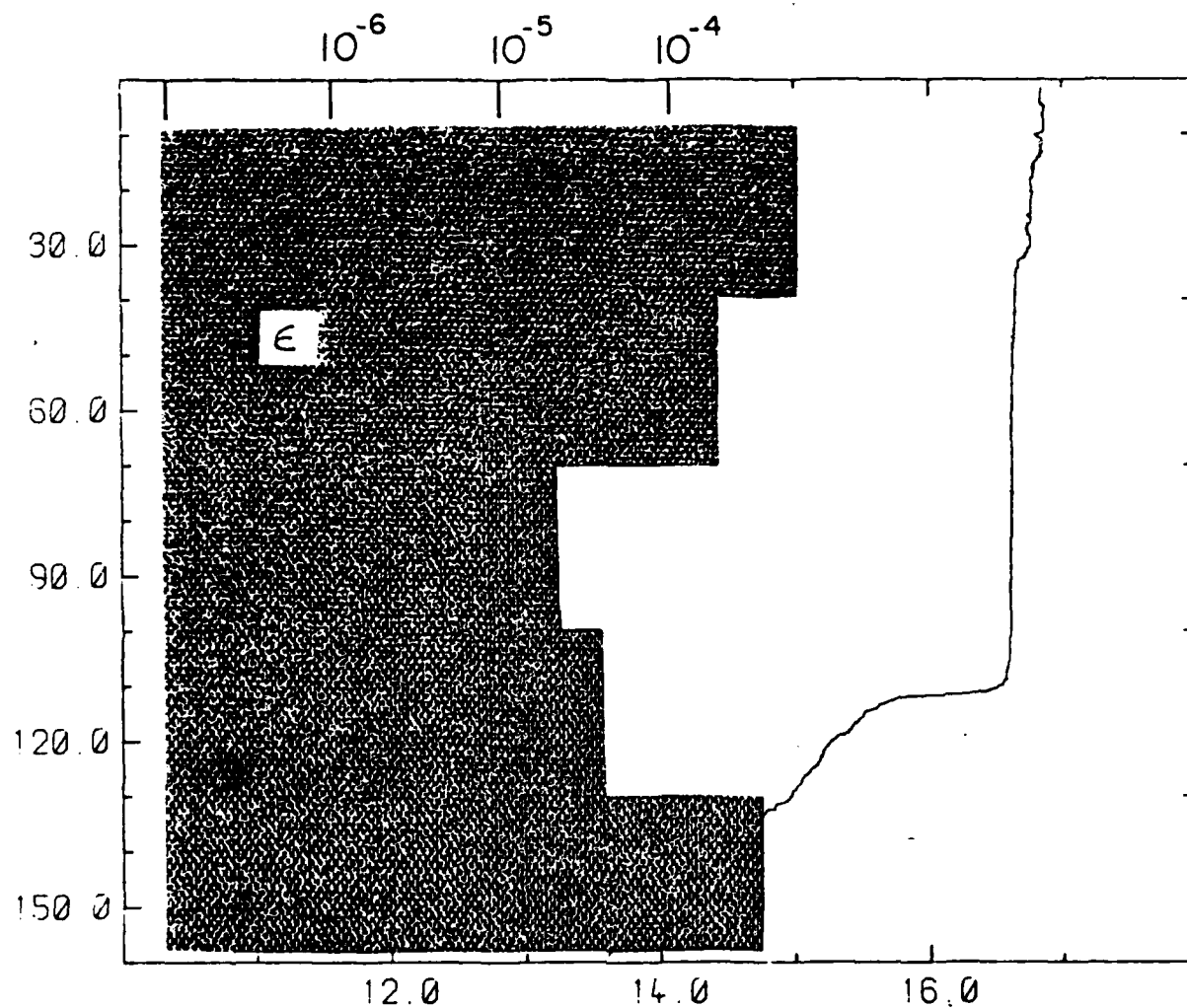
DATE 1/29/80  
TIME 0209 GMT

TAPE F10 FILE 2  
UNIT 2.79



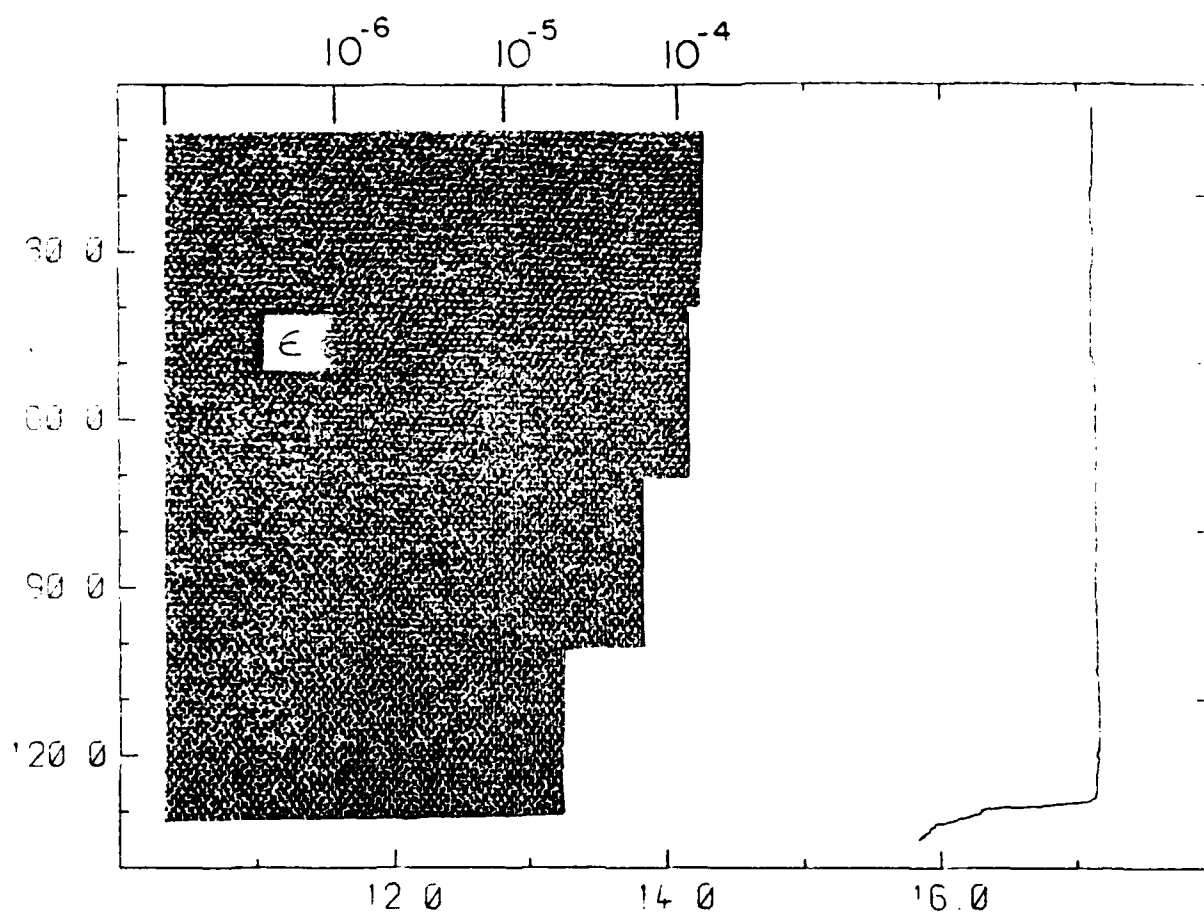
DATE 1/15/80  
TIME 0935 GMT

TAPE F2E FILE 1  
UNIT 3.79



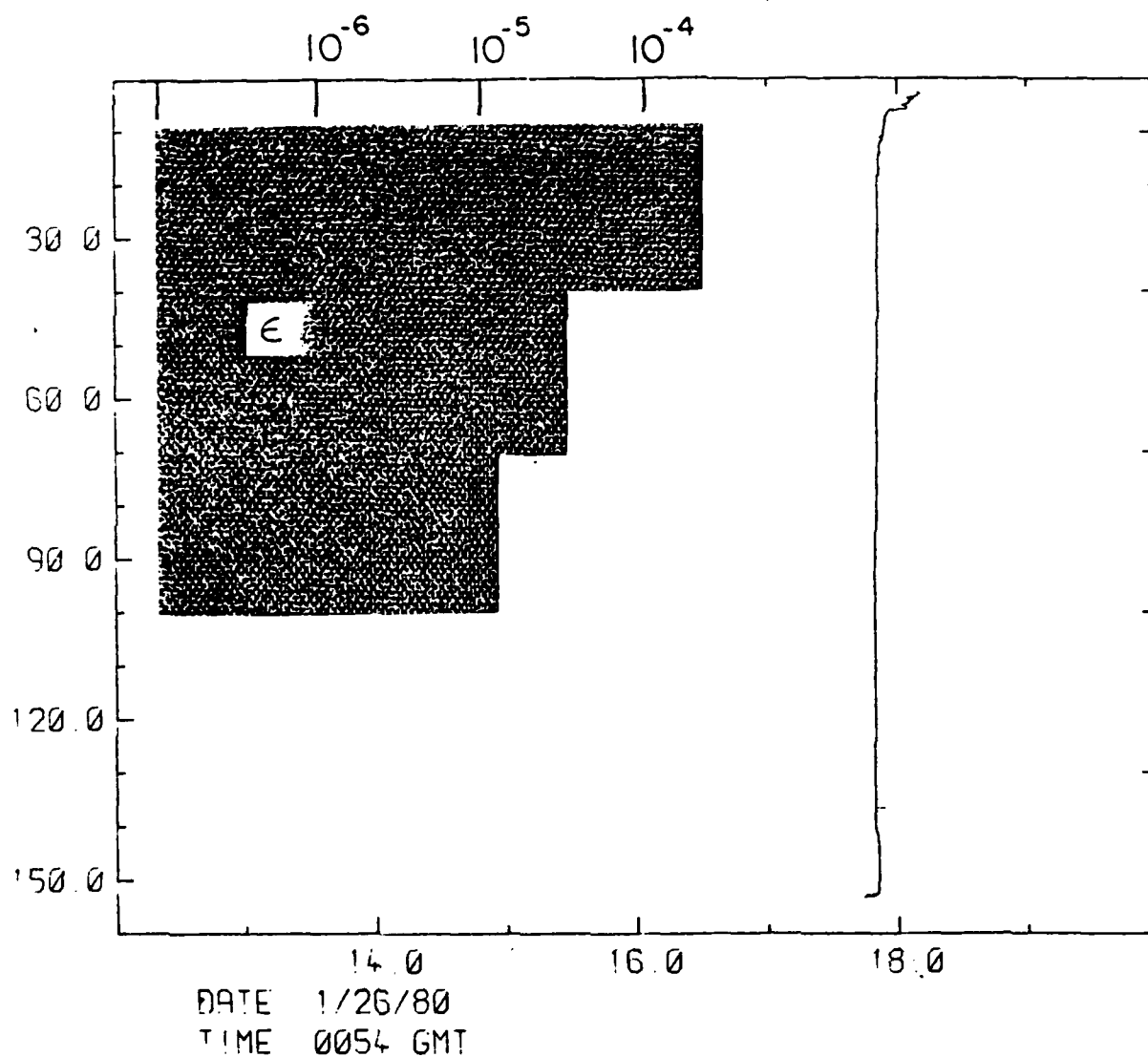
DATE 1/24/80  
TIME 0124 GMT

TAPE F3E FILE 1  
UNIT 2 79



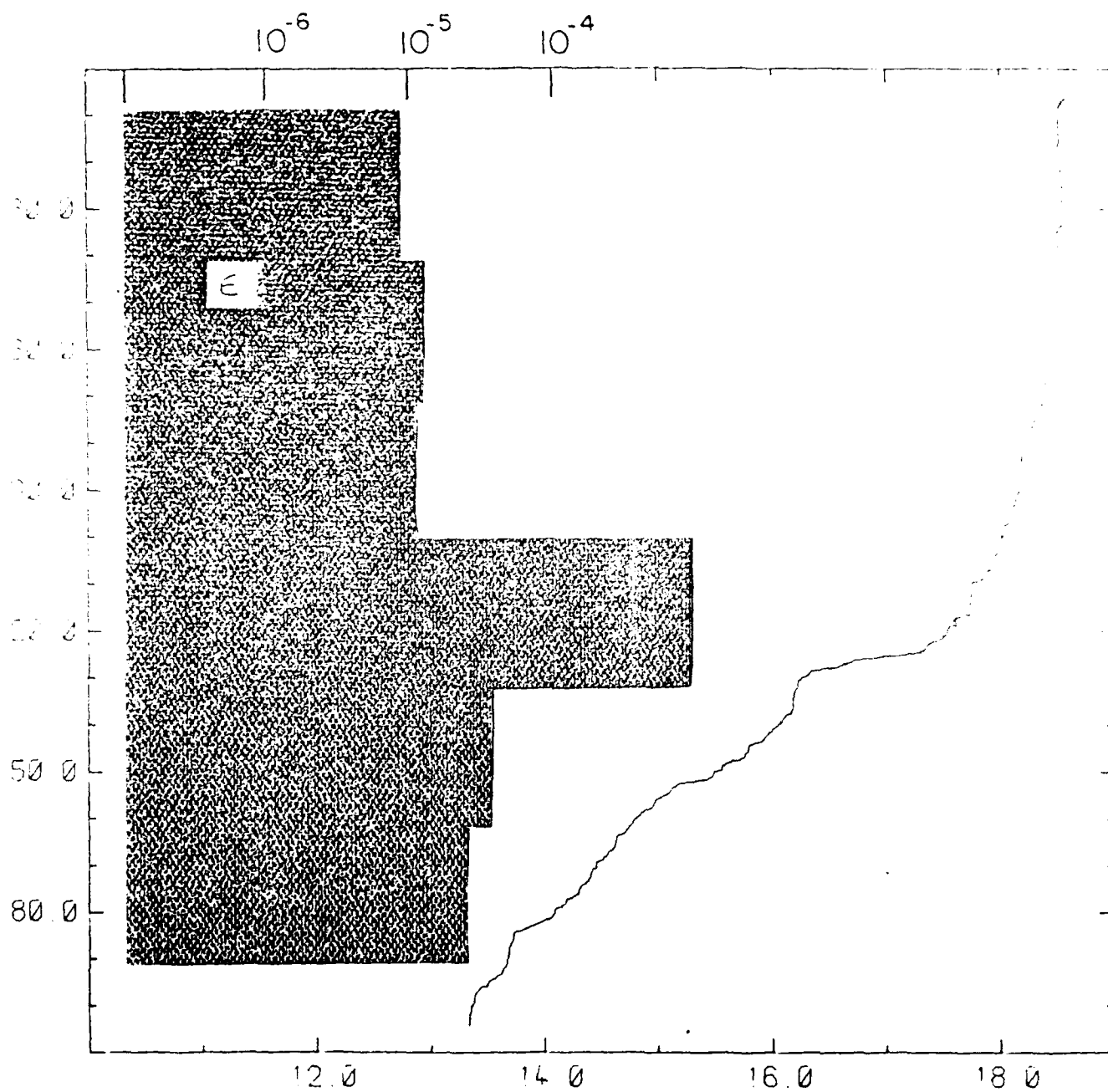
DATE 1/24/80  
TIME 2317 GMT

TAPE F50 FILE 3  
UNIT 2 79



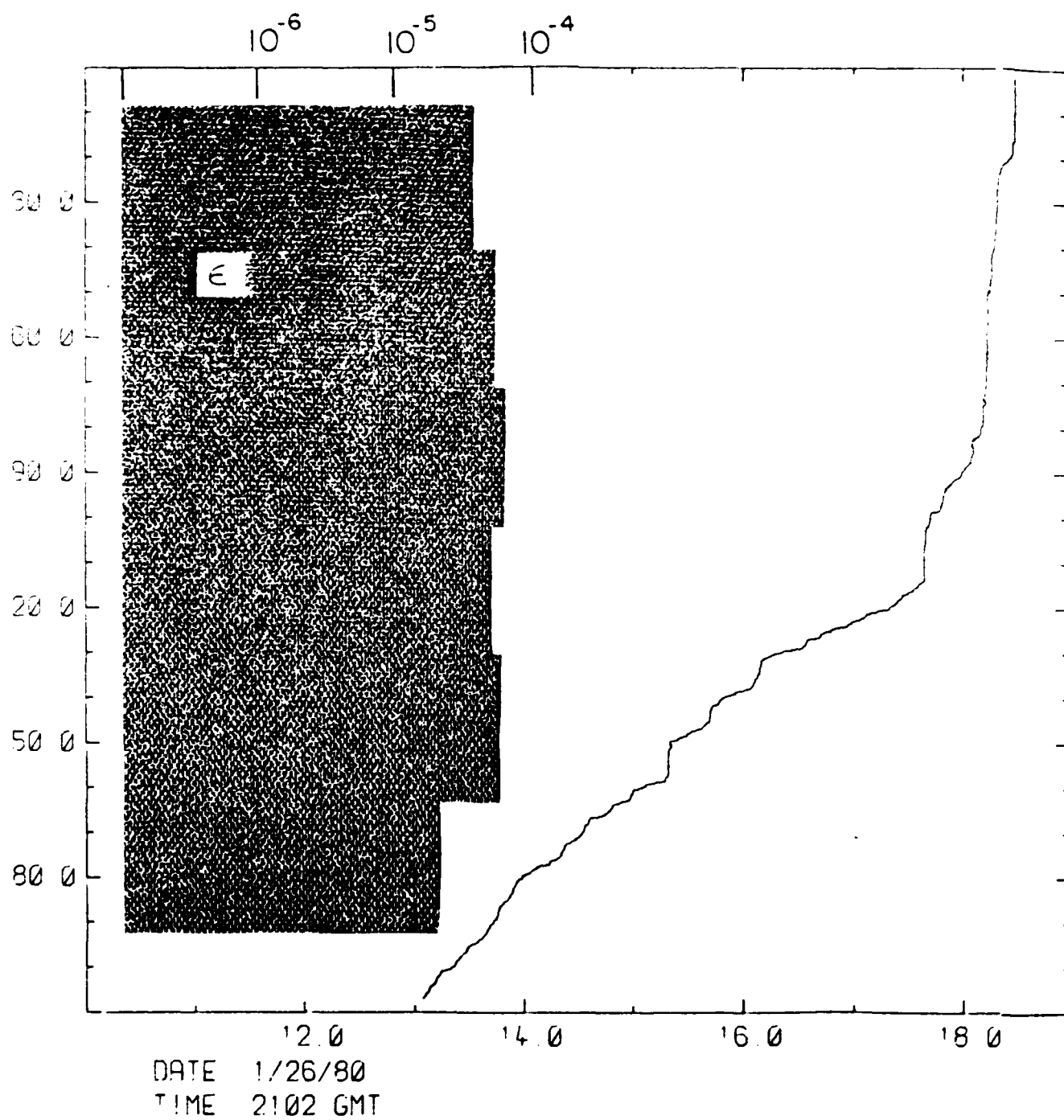
TAPE F5E FILE 2  
UNIT 2 79

125



DATE 1/26/80  
TIME 0351 GMT

TAPE F08 FILE 1  
UNIT 2 79



L MED  
8